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THE EXPERIMENTAL DEALER TRAINING PROGRAM, A PRELIMINARY SUMMARY REPORT OF THE PROGRAM. RURAL SOCIOLOGY REPORT, 56.

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AN EXPERIMENTAL ACTION ANL RESEARCH PROJECT WAS CONDUCTED DURING 1960-64 BY THE IOWA AGRICULTURAL AND HOME ECONOMICS EXPERIMENT STATION, IN COOPERATION WITH THE TENNESSEE VALLEY AUTHORITY, TO DETERMINE THE INFLUENCE OF AN INTENSIVE TRAINING PROGRAM FOR GENERAL MANAGERS OF LOCAL RETAIL FARM SUPPLY RETAIL BUSINESSES DEALING IN FERTILIZER AND AGRICULTURAL CHEMICALS. CHANGES IN KNOWLEDGE, ATTITUDES, AND PERFORMANCE, INTERNAL ENVIRONMENT AND ACTIVITIES OF BUSINESS FIRMS, AND ECONOMIC RETURNS OF THE TOTAL BUSINESS AND OF THE FERTILIZER AND CHEMICALS DEPARTMENTS WERE ASSESSED. EIGHT TREATMENT, TWO ALTERNATE TREATMENT, AND EIGHT CONTROL GROUPS WERE USED. ECONOMIC DATA WERE GATHERED FROM BUSINESS RECORDS, AND OTHER DATA WERE OBTAINED IN PERSONAL INTERVIEWS. FIVE VARIABLES OF KNOWLEDGE, TWO RELATING TO ATTITUDES, 13 RELATING TO PERFORMANCE, FOUR PERTAINING TO THE BUSINESS FIRM AND TO GENERAL MANAGEMENT, AND 14 IN THE AREA OF ECONOMIC RETURNS FAVORED THE TREATMENT GROUP (PARTICIPANTS IN A FIVE-DAY WORKSHOP FOLLOWED BY 16 MEETINGS OVER TWO AND A HALF YEARS), TOGETHER WITH 11 STATISTICALLY SIGNIFICANT VARIABLES. EVEN CONSIDERING LIMITATIONS OF SAMPLE SIZE AND LENGTH OF TRAINING, THE TRAINING PROGRAM WAS JUDGED SUCCESSFUL. THE DOCUMENT INCLUDES FIVE TABLES AND A SUMMARY CHART OF TRAINING ACTIVITIES. (LY)

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THE EXPERIMENTAL DEALER TRAINING PROGRAM

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A Preliminary Summary Report
of the Training Program

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This report is a preliminary summary of findings from an experimental action and research project designed to determine the effect of an experimental training program conducted for retail farm supply dealers (general managers) who sold fertilizer and agricultural chemicals as two of their product lines. Additional analyses are in process. Therefore, modifications and revisions may be made in this draft. The revised report will be published as soon as the additional analyses are completed.

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INTRODUCTION

The planning, development, implementation and evaluation of educational programs are a primary concern of industry and educational institutions. Many types of short courses, field days, conferences and training programs are conducted each year to provide education and training on a wide variety of topics to numerous types of audiences. The major purpose of these types of educational programs is to provide assistance to individuals so that they can better fulfill their occupational roles. Although there is an abundance of literature on planning, developing and implementing training programs, a scarcity of research exists on the measurement of the effect of these programs. The advisability of evaluating educational programs is emphasized but relatively few research projects have been designed to measure changes in human behavior resulting from participation in these programs.

In business and industry, only limited research has been completed on the impact of the training programs on the participants. This is especially true of training programs attempting to change a complex behavior pattern such as management. The limited training program research which has been done in most cases has been directed at job knowledge and job performance for production and clerical employees and insurance agents. Apparently, there is a need for systematic and carefully controlled research to measure the impact of training programs in business and industry, particularly at the managerial and supervisory levels.

This summary report is based on an experimental research project designed to determine the effect of an experimental training program conducted for retail farm supply dealers (general managers) who sold fertilizer and agricultural chemicals as two of their product lines. From 1960 to 1964, this project was conducted by the Agricultural Experiment Station at Iowa State University of Science and Technology in cooperation with the Tennessee Valley Authority. Drs. George M. Beal and Joe M. Bohlen, Professors of Rural Sociology, Department of Sociology and Anthropology, Iowa State University, were co-leaders for both the educational and research phases of the project. Dr. Richard Warren, also of the Rural Sociology Department at Iowa State University, was Project Coordinator for both phases of the project. The educational phase consisted of planning, organizing and implementing an intensive training program for ten local retail farm supply and marketing dealers who sold fertilizer and agricultural chemicals. Intensive training was given in the areas of business management,

merchandising and product information about fertilizer and agricultural chemicals. The research phase included setting up the experimental design; designating the participating and control managers; and measuring the influence of this training upon the manager, his business firm, and his farmer customers.

The general project objectives were as follows:

1. To determine the impact of a combination of informational and educational techniques upon the adoption and use of fertilizer and fertilizer practices.

2. To determine the role which dealers may play in this process.

3. To appraise the efficacy of using a more intensive dealer training program to raise the level of fertilizer use to more nearly approach an economic optimum.

4. To provide measures for evaluation of conventional extension methods relating to education on fertilizer use.

Objectives for both the educational phase and research phase of the project were also developed. The general educational objective was:

> To provide dealers with information, tools and training in basic business management and merchandising as well as product information on fertilizer and agricultural chemicals to the end that farmers would use fertilizer and agricultural chemicals to more nearly approach an economic optimum.

Based on this general educational input objective, five result objectives for the educational phase of the project were formulated. These objectives were stated at different levels of expected training program influence. Level A result objective was to increase the dealers' (managers') knowledge and understanding about basic business management and merchandising and to increase their knowledge and understanding of product information on fertilizer and agricultural chemicals. This objective was also oriented toward bringing about desired changes in managers' attitudes and perceptions. Result objective level B was to motivate dealers to carry out certain actions and activities in their role as manager of a local retail farm supply business and as a dealer for fertilizer and agricultural chemicals. Result objective level C was to help managers achieve certain changes in the internal environment and activities of the business firm. Result objective level D was to assist managers to achieve certain outcomes in their business operations: (1) increased volume, efficiency and profits in their entire business and (2) increased volume and marginal profitability of the fertilizer and agricultural chemicals departments. Result objective level E was to help managers to assist in raising the farmers' use

levels of fertilizer and agricultural chemicals in their respective trade areas to more nearly approach an economic optimum.

The general research objective was:

> To measure the influence of the training program on the managers, their business firms and their farmer customers in those areas delineated by the general objective and the five result objectives of the educational phase.

This summary report will deal only with specific aspects of the general project. The analysis will be limited to the influence of the training program on the manager, his entire business firm, his fertilizer department and his agricultural chemical department.

Differences in the fiscal years of the managers and variation in bookkeeping systems used by the managers required the collection of income and expense data for the different departments as well as on a monthly basis. Since this detailed data collection was not foreseen at the beginning of the project, additional funds were needed for the collection of these economic data. It was also decided that if funds became a limiting factor, the detailed collection and analysis of economic data would have priority over the final benchmark interviewing of farmers. Hence, the impact of the training program on the farmer-customers can only be measured indirectly. One indirect measure of the impact on farmers could be the managers' perceptions of the impact on farmer-customers. Other indirect measures may include inferences based on changes in the behavior of the manager and his business firm. For instance, increased fertilizer sales might reflect increased farmer use and use nearer an economic optimum. However, these inferences will need to be interpreted with caution because as in the case of the example mentioned, part of the increased sales might reflect changes in purchasing patterns of farmers--a change in dealer from whom fertilizer is purchased.

Specific objectives for general areas of training and each meeting were developed. These objectives are stated in the summary notebooks containing all the distributed training program materials. The summary notebooks are now available on a loan basis.*

In the next section, the problem setting, the situational setting of the retail dealer, the background for the study and the training program will be discussed.

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*Notebooks can be obtained on a loan basis through the Department of Sociology and Anthropology, Iowa State University, Ames, Iowa.

BACKGROUND FOR STUDY

American society is in a period of transition. In recent decades, rapid changes have occurred in the economic, social and political fields. Viewing society, in general, considerable adjustments and adaptations have been made and are being made to this changing situation.

The total complex of agriculture in the United States has experienced rapid changes in social structure, technology and the economics of production and marketing.

A broad concept of agriculture will be used in this report. This includes: farming itself, the manufacturing and distribution of farm supplies and the processing and marketing of food and agricultural products. Therefore, the total complex of agriculture may be divided into three segments: (1) farmers who produce the farm products, (2) those industries which furnish farm supplies and related services to farmers and (3) those industries engaged in the transporting, processing and marketing of farm products.

In the farm segment, the rapidly changing situation has been characterized by rapid advances in agricultural technology, substitution of more and more capital for labor, increased average farm size, decreased total number of farms, increased productivity per man, improved production efficiency, and a decrease in the number of farm people. There is also increased specialization in the function of the farm firm and specialization in the role of the farm operator. These changes have affected both rural and nonrural communities.

Major changes are occurring in major institutional systems, social organizations and values and beliefs in both the American society and the agricultural sector.

Those industries serving agriculture in supply and marketing capacities have also changed. The channels used for supplying purchased inputs to farmers and marketing farm products, as well as the institutional organization and structure, and services these industries perform are changing constantly. As agriculture moved from the subsistence farming of a century ago to present day commercial farming, there has been an increasing dependence of farmers upon agribusinesses for purchased products and services on the input side and nonfarm market services on the output side. While there has been declining employment on the farm, there has been an increase in the number of workers in both the farm supply and marketing firms.

There is an interdependence between the three sectors of the total complex

of agriculture; there is also an interdependence between those sectors of the economy and other sectors of the economy. Conditions and adjustments in the agriculture sectors are influenced by total economic progress.

In recent years, much has been written about the changes, adjustments and needed adjustments in agriculture and rural society. Agricultural adjustment programs are being planned and implemented to assist the farmer and his family to adjust and to adapt to changing situations. The businesses which serve in supply and marketing capacities are very important factors from an agricultural adjustment viewpoint. The preceding discussion has pointed out some of the factors which give these businesses this importance. Many small town businesses face problems in adjusting and adapting to the changing agricultural situation. This area of agricultural adjustment has not received the attention that other areas have received.

This report focuses on an experimental project involving a training program for small town businesses serving agriculture in supply and marketing capacities. It is limited in scope and number of businesses. Only one category of dealers will be studied. The participating dealers in this training program were small town retail farm supply dealers who served as sources of supply to farmers for fertilizer and agricultural chemicals. In addition to these two product lines they also supplied various other farm supplies and marketing services.

A decreasing farm population in an area is often accompanied by a decreasing nonfarm population. Therefore, many businesses serving rural communities face adjustment problems. Those businesses which provide agricultural production inputs or serve as market outlets are relatively better off than those businesses which depend on absolute population numbers. Although the total number of farms and farmers is decreasing, the use of purchased resources such as machinery, fertilizers, prepared feeds and services is increasing. Increased total farm production and increased demand on the part of consumers for processing and marketing services connected with food products increase the demand for and use of firms engaged in the processing, distributing and marketing of farm products.

In addition to the products sold and processed the local businesses provide many related services to the farm people in the community. Some of these services include grinding and mixing farm feeds, spreading commercial fertilizer, testing of soil, testing of seed, processing, packaging, storing, cleaning and transporting farm inputs and products. Since the majority of the activities

of the local farm supply and marketing business are carried out directly with farmers, these farmer-customers, in many instances, seek advice and guidance concerning their operations during the purchase of farm supplies. Therefore, it appears important that the managers and key employees in these businesses have an understanding of farm management and production principles and keep well informed on new farm technology. Sound information and recommendations, quality production inputs and related services provided by these businesses should be a direct economic asset to the farmer because they make it possible for him to increase the efficiency and profits of his farming operations.

From another viewpoint, cost reduction and improved efficiency in the farm supply and marketing industries should be beneficial to both farmers and managers. On the farm supply side these factors should help reduce farmers' costs for purchased inputs used in their operations. On the marketing side these factors should help in improving demand for farm products, permitting better prices for farm products and achieving greater stability of farm prices.

Local farm supply and marketing businesses often play an important role in the community. They contribute to the economy of the local community by providing employment for labor and through the payment of local taxes. In many instances, they play an important credit function in the farm economy. Many local businessmen participate in community affairs, support civic organizations and activities, and assume other civic duties and responsibilities.

The reasons for selecting fertilizer and agricultural chemical managers will be examined briefly in the following paragraphs.

Commercial fertilizer and agricultural chemicals are two important technological innovations being used by farmers to increase production efficiency and financial returns. These products can increase efficiency by decreasing the per unit cost of crop production. The use of fertilizer and agricultural chemicals has increased substantially in recent years. While Iowa farmers have used increasing quantities of fertilizer and agricultural chemicals, educational institutions, extension workers and those in the fertilizer and agricultural chemical industries believe that the use of these innovations still falls below optimum levels. Optimum use is used in the context of marginal returns and marginal costs. It is difficult to determine optimum resource allocations that are generally applicable. Optimum levels of fertilizer and agricultural chemical use can be determined for an individual farmer. These optimum levels should be based on changes in production that result from optimum use of available resources. The farmer's goals, objectives, skills, knowledge and abilities can be considered in determining his optimum level of use. On a state or national

basis, the optimum potential is difficult to determine accurately because of the nature of production practices and aggregation problems. However, it is generally agreed that considerably more of these products could be used to an economic advantage by farmers. Estimates place the annual potential fertilizer use in Iowa between 1,500,000 and 2,000,000 tons. This would be about three times the present level of use, estimated to be approximately 660,000 tones of fertilizer.*

The fertilizer and agricultural chemical dealer plays a vital role not only in the distribution of fertilizer and agricultural chemicals but research shows he also is an important source of information about these products and their use. Though some questions are being raised about the present and future role of the dealer in the distribution and information system, the dealer still plays a major role in many parts of the country, certainly in Iowa, at the present time. In Iowa and other parts of the country, the most common method of farmer procurement of these products is by purchasing them through local farm supply dealers. In the distribution system, these dealers are the final link between the producer (industry) and the user (farmers). Certain dealers provide many related services connected with these two product lines. Examples include taking soil samples, interpreting soil test reports, spreading fertilizer, sponsoring and conducting demonstrations, and providing rental equipment for application. One of the major fertilizer industry trends is the sharp increase in the proportion of fertilizer applied for farmers by dealers. Dealers by performing these functions may influence the amount and types of fertilizer and agricultural chemicals that are used by farmers in their production operations. Increasing the efficiency of these businesses and improving the qualifications of the dealer as an information source can be important to the farmer-customer as well as to the businesses themselves.

The preceding discussion indicates that a potential for profitable increased use of fertilizer and agricultural chemicals exists. Therefore, a potential for increased sales of these products also exists. There are two possible general benefits to be derived by increased sales of fertilizer and agricultural chemicals by retail dealers. From the dealers' viewpoint, there is a potential for increasing economic returns to the business by increasing sales as long as these products are sold at a profitable margin. From the farmers' viewpoint, they should be able to increase their profit by using more fertilizer and agricultural

*Based on 1960 estimates.

chemicals as a means of assisting them to lower their per unit cost of production and improve efficiency.

Increased use of fertilizer and agricultural chemicals could increase crop yields, output per man and farm production efficiency. Increased efficiency by the use of these products does not necessarily imply increased total crop production. It may mean increased efficiency of production on fewer crop acres. An increase in total crop production may or may not be a benefit to the farmer, other segments of agribusiness and/or to society; in the case of farm products which have an inelastic demand, increased production in itself can be detrimental.

Some reasons for increased sales and use of fertilizer and agricultural chemicals as well as the role the dealer plays in this process have been briefly discussed. Education and training of persons are often suggested as a means of improving the communication and distribution systems for fertilizer and agricultural chemicals to the end that farmers would use these products to more nearly approach an economic optimum.

If the local farm supply dealer is to be a continuing part of the distribution structure and provide farmers with information, recommendations, instructions and services related to fertilizer and agricultural chemicals, it appears essential that he have a basic knowledge of these products, their use, their application and have the programs and skills to communicate with and service the farmers. The recognition of this need has been verbalized by both industry and educational institutions. Also, most dealers who sell fertilizer and agricultural chemicals also sell other farm supplies and some are engaged in marketing activities. Education programs should be of benefit in assisting dealers to adjust and adapt to a wide variety of changing situations.

In a more general context, the education of workers and management personnel in farm supply and marketing industries is necessary to assist in making adjustments to a rapidly changing situation so that they may continue to contribute to general progress and efficiency of agribusiness. These contributions should be reflected in the total growth and progress of the nation.

Out of this general interest in and concern about retail farm supply and marketing firms and the specific interest in those selling fertilizer and agricultural chemicals, an intensive training program for a group of retail farm supply and marketing dealers who among their business activities sold fertilizer and agricultural chemicals was developed and carried out.

FRAMEWORK FOR ANALYSIS

Approach

In the present analysis, the basic approach will be that of the social system framework. The present intensive training program was directed at providing training to an occupant of a position in a particular social system. More specifically, the training program was conducted for the general manager of a retail farm supply firm--a social system. This analysis is directed at analyzing: (1) behavioral changes of the dealer in his role as general manager of a retail business, (2) changes in activities of this business and (3) changes in operational outcomes of this business. The general setting for this approach is briefly outlined in the following paragraphs.

Individuals have various kinds of needs. The social environment provides guidelines by which choices among alternatives are made in determining behavior for the fulfillment of those needs. The individual is a member of many social systems and his behavior is influenced in part by these membership social systems as well as other social systems in society (society may also be considered a social system). There is an exchange between the individual and the social systems of which he is a member. Limiting the discussion to one social system, the individual "receives" from the social system certain norms of behavior, values, status, approved means for goal attainment, etc. to guide his behavior and is rewarded or punished accordingly for his behavior in that social system. In turn, at the end of the action sequence(s) by the individual and because of it, the social system may have achieved or failed to achieve its desired ends. The social system then may mete out either positive or negative sanctions in accordance with the quality of performance of the individual actor. In other words, the social system "provides" guides for the individual's behavior and in turn his behavior helps or hinders the social system in reaching some desired outcome. Rewards and punishments may be meted out by the social system according to the individual's performance in that social system.

The intensive training program was structured to provide information which would assist the general manager in his business firm. It is recognized that the business firm of which he is general manager will influence his perception, evaluation and the use made of the information received in the training program. In this study, the business firm social system is of prime importance from two standpoints. First, this social system (the business firm) compared to others

will probably most directly influence the general manager's perception and evaluation of the training and provide the incentive for learning and retaining knowledge and skills. Second, it is within this social system that the knowledge and skills obtained from training will be implemented. It is realized that other social systems may influence his perception and evaluation of training. Also, he may use information obtained from the training program in other social systems; e.g., the training in decision-making may be used in making family decisions. Although these other social systems are important, this analysis will be restricted to the changes in individual behavior pertaining to the business firm and changes in the business firm. Special emphasis is placed on changes in operational management of the local retail business firm. The general manager must manage a set of variables. He manages these variables within a local retail business firm context which places both potentialities and restrictions on the alternatives available to him, on the process of selecting among alternatives and on the implementation of the decisions. The decisions he makes as well as the implementation and evaluation of these decisions are affected by the fact that he operates within a social system and this social system is linked to other social systems and to larger social systems such as the consumers, an industry and the economy.

The first changes to be examined are those occurring in the behavior of the general manager. These behavioral changes include changes in knowledge and attitudes as well as changes in the quality of performance. Business firms in this study are relatively small and less complex when compared to larger businesses. Therefore, the various aspects of management are more nearly concentrated in one individual in these smaller firms. Therefore, it is assumed that the general manager of the retail farm supply business in this study should be influential in bringing about changes in the activities of and outcomes of the firm.

When a training program has been adequately conducted, the expectation is that the experience will modify the behavior of the persons trained. If training is conducted for persons who are members of a business organization, the training is usually directed at changing the behavior of the individual receiving the training so that he can more adequately perform his occupational role. It is assumed the resultant behavior will result in certain activities that will contribute to the attainment of the goals and objectives of the organization in which he works. The personnel conducting this particular training program expected changes in the general manager's (dealer's) behavior, in the activities of the business firm and outcomes for the (results for his) business firm.

It was assumed that if certain aspects of the behavior of these managers could be influenced in a desired direction then the efficiency and profitability of the business would be improved. In the special emphasis area of fertilizer and agricultural chemicals, it was assumed that the sale of these products could be increased. The training program should provide the manager with a learning situation. By providing new information, the training would have the potential of influencing the knowledge and attitudes of the individual manager. If the managers' knowledge and attitudes are changed in a favorable direction toward their businesses, their products, their services and their farmer-customers, then this should be reflected in behavioral changes of the managers, changes in services and activities of the business, and changes in economic and other outcomes in the business.

It is recognized that changes at one level may influence changes at other levels. For instance, changes in the manager's performance may bring about changes in the activities of the firm or economic returns for the firm. On the other hand, a change in economic returns for the firm may be a motivating factor for a manager to acquire additional knowledge, or to change an attitude or to change performance.

If the training program changes the knowledge, attitudes and performance of the managers, these changes may influence the internal environment and activities of the business firm. If changes occur in these areas, then changes may occur in economic returns of the business firm. However, in this analysis, the interrelatedness of these changes will not be tested. Because of data limitations, the order of change in many cases is not possible to ascertain. The interrelationship of variables was discussed above to point out the relevancy of each of these areas in determining the influence of the training program. Changes in the following areas will be analyzed: (1) manager's knowledge, (2) manager's attitudes, (3) manager's performance, (4) internal environment and activities of the business firms, and (5) economic returns of the entire business, the fertilizer department and agricultural chemicals department. Changes in each of these areas will be analyzed separately.

Desirable changes

Why is it desirable that general managers change their knowledge, attitudes and performance? The basic assumption is made that a certain level of knowledge, attitudes and performance is necessary if the general manager is to

fulfill his responsibilities as a local retail farm supply dealer. In addition to being a source of supply for many goods and services used in agricultural production, individuals within the business provide information and materials to farmer-customers about products and services as well as their use. The general manager's level of performance has implications for the total complex of agribusiness. General managers, such as fertilizer and agricultural chemicals dealers, are a part of a very complex distribution and communication systems for fertilizer and agricultural chemicals. Based on previous research findings, there appears to be a wide range in knowledge about, attitudes toward and services provided in connection with fertilizer and agricultural chemicals. Improved efficiency and effectiveness of the local retail farm supply businesses have many implications for the businesses themselves as well as for their farmer customers and those industries which furnish farm supplies and related services.

Certain content areas and certain materials were selected by the action committee for the training program. It was assumed by the action committee that those areas selected would be beneficial to the general managers in improving the operational management of the local retail farm supply business and this would be reflected in improved efficiency and effectiveness of the business. The members of the action committee represented many subject matter areas. The decisions made by committee members to include certain areas for training were based on: past research conducted in these fields; their past experiences with and their knowledge about the problem areas in management where it was judged knowledge existed that would be of value to general managers; and guidance and advice received from sponsors and representatives of industry and the dealers in the training program.

It is recognized that each dealer, each business firm and each community in which the firm operates is unique. The complexity of management in the business firm makes it improbable that the managers of several firms would need or would be able to use or attain exactly the same level of knowledge, attitudes or performance. The opportunity for change is not the same for all general managers. Beginning levels of knowledge, attitudes and performance of the general managers as well as beginning levels of the operation of the businesses could influence the amount and type of changes made. Social and personal characteristics of the general manager, characteristics of the business firm and situations including relevant aspects of the physical and social environment would be factors influencing the relevancy of making particular changes. In other words, differential change may occur because of factors such as: the general manager's

beginning level knowledge, attitudes and performance; beginning resource levels of the business firms; the social structures of the business firms; beginning levels of output of the business firms; goals and objectives of the firm; competition situation; and different potentials and opportunities for change regarding both the general managers and their business firms. Based on the general framework within which the training was offered, it was the responsibility of the general managers in their decision-making processes to select and use the information presented and materials provided which best served their needs and goals.

Educational result objective level E was to help general managers, as retail dealers, to assist in raising the farmer's level of use of fertilizer and agricultural chemicals in the respective trade areas to more nearly approach an economic optimum. Research objective level E was to determine the effectiveness of the general manager, as a retail dealer for fertilizer and agricultural chemicals, in increasing the level of fertilizer and agricultural chemicals use to more nearly approach an economic optimum. This implies that farmers as well as managers could ultimately benefit from the training program if the sales of these products were increased along with improvement in related services including informational services. Therefore, dealer-customer relationship was considered in the process of selecting training content areas.

The training program included areas which might cause changes: (1) in knowledge and attitudes of the general manager, (2) in performance of the general manager, (3) in internal environment and activities of the business firm and (4) in the outcomes for the business firm. All of these could be of ultimate benefit to farmers.

Because of the size and complexity of the training program, it was impossible to obtain detailed research measures in all content areas of the training program. Rather, selected changes which could result from training in certain aspects of some of the broad content areas were measured. It is beyond the scope of this report to present an analysis of all data collected in the research phase of the project. The emphasis areas for knowledge, attitudes, performance, internal environment and activities of the firm and outcomes of the business firm have been previously discussed. Limitation of funds prevented securing data on changes concerning the farmer-customers of these businesses.

ACTION AND RESEARCH ACTIVITIES

Training Activities

General

The project started July 1, 1960, and the training phase ended June 30, 1964. Activities of the first six months included the planning of the content areas of the training program and selection of an area of the state in which to conduct the project. The actual selection of dealers to participate in the training program was made early in 1961. Ten dealers, representative of the various types of farm supply businesses in the area of the state in which the study was conducted, were selected to receive the training. The training was started in February, 1961, with a week long workshop and ended in April, 1963, with a product information meeting.

The people involved in planning the training program included: (1) the Iowa State University educational committee for the dealer training program, (2) representatives of the fertilizer industry, (3) all managers involved in the training, and (4) a manager executive committee elected by the managers.

The members of the Iowa State University educational committee were: George M. Beal, Rural Sociology; Joe M. Bohlen, Rural Sociology; Harold Gunderson, Entomology; H. B. Howell, Agricultural Economics; Lee Kolmer, Agricultural Economics; Richard Phillips, Agricultural Economics (until February, 1962); Joe Stritzel, Agronomy; E. P. Sylwester, Plant Pathology and Botany; and Richard D. Warren, Rural Sociology.

Roy Hougen and Bob Olesen, Graduate Assistants in Rural Sociology, assisted in planning several of the action activities.

Zenas Beers, National Plant Food Institute; John I. Bucy, Tennessee Valley Authority; Frank Achorn, Tennessee Valley Authority; and, Harold G. Walkup, Tennessee Valley Authority also assisted in planning activities for the dealer training program.

At a general level, the major content areas of the training program may be designated in terms of basic business management, merchandising and product information on fertilizer and agricultural chemicals. Special emphasis was placed on: the fertilizer department; the agricultural chemical department; the retail dealer's role with his farmer customers; long-range planning including systematic capital budgeting; certain service activities such as soil

testing, interpreting soil test results and result demonstrations; merchandising, advertising and promotion; and resources available to the retail dealer, particularly in the area of information.

The methods and media used to communicate the content areas at the workshop and follow-up meetings were: (1) presentations by Iowa State University staff members; (2) presentations by trade and industry representatives; (3) a presentation by another retail dealer; (4) a presentation by representatives of a consulting firm; (5) distribution of notebooks and printed materials including summaries of presentations; (6) case examples, case problems, visual aids, homework assignments and field demonstrations; (7) informal discussion sessions; and (8) "idea exchange" sessions. In addition each business was visited periodically and individual assistance provided upon request.

The training program in which the managers participated consisted of a five-day workshop and sixteen follow-up training meetings held over a two and one-half year period. The follow-up meetings varied in length from twelve hours (an all day meeting and an evening session) to three hour meetings. Some of the shorter meetings were held in the evening. The total number of hours of training was approximately 140 hours.

The training leaders for the five day workshop and the follow-up training meetings included Iowa State University staff members, representatives of the Tennessee Valley Authority, the National Plant Food Institute, the fertilizer industry, a consulting firm and a private retail dealer.

The workshop was conducted February 20 to 24, 1961. The last formal training session, a product information meeting and banquet, was held on April 2, 1963. From February, 1961 to June 30, 1964, individual assistance was provided treatment dealers who requested it.

Workshop

Iowa State University staff members and representatives of the Tennessee Valley Authority and the National Plant Food Institute planned the initial five-day workshop, including content areas, the major points to be covered under each content area and time allocations. The workshop material was presented by Iowa State University staff members, personnel from a private consulting firm and a private retail dealer. The presentations, by content areas, at the workshop were as follows:

1. Farmer market potential.
2. Dealer motivation.

Summary Chart of Activities
DEALER TRAINING PROGRAM

Action Phase		Research Phase	
Planning Content Areas and Preparation of Presentations and materials	July, 1960 ↕ January, 1961		Conceptual design and development of survey instruments Interviewing dealers in nine county area Selection of Treatment and Control Dealers
Week long Workshop on basic business management and product information about fertilizer and ag. chemicals	February, 1961		Benchmark interviewing of Treatment and Control Dealer
Five(5) meetings on demonstrations	April ↕ Nov., 1961	March April 1961	Interviewing a random sample of farmer customers--each Treatment and Control Dealer
Three(3) days on Systematic Capital Budgeting	Dec., 1961 Jan., 1962	June Aug. Dec. 1961	Interviewing Treatment Dealers to secure information on changes and program evaluation
Two(2) Product Information meetings on Fertilizer and ag. chemicals	March, April 1962		Interim interviewing of Treatment and Control Dealers
Two(2) meetings on advertising, and Promotion	July, Dec. 1962	June, Aug. 1962	Interviewing Treatment Dealers on changes and program evaluation
I.S.U. Fertilizer and Ag. Chemicals Short Course	Jan. 1963	Feb., 1963	
Fertilizer Trend meeting	March, 1963	March ↕ Sept. 1963	Preliminary preparation of objective report and work on Benchmark schedule and continued data analysis
Product Information meeting	April, 1963		
		Sept., Oct., 1963	Final Benchmark interviewing of Treatment and Control Dealers
		Nov., 1963-Feb., 1964	Collection of Economic Data
		Feb. 1964 to present	Adjustment of economic data to make comparable and calculation of needed interim data; data analysis; and report writing

3. Economics of the farm business.
4. Situation statement.
5. Basics of management-including a case example of management basics and techniques.
6. Dealer role, customer understanding, sociology and social psychology of education and adoption.
7. Some possible methods for use in building a better business.
8. Basic principles of fertilizer use.
9. Basic principles of weed control.
10. Basic principles of insect control.
11. Role of soil testing and demonstrations in fertilizer sales.
12. How to sell.
13. How Iowa State University makes recommendations.
14. How dealers can use Iowa State University recommendations.
15. Potential cooperative relationships with other agencies.
16. Follow-up training alternatives.

Follow-up meetings

Five of the follow-up training meetings with the managers were in connection with a field demonstration conducted during 1961 by Iowa State University extension specialists and county extension staffs. The purposes of the demonstration were: (1) to teach knowledge about and show the interaction effect of fertilizer, herbicides and insecticides; (2) to discuss and show the steps and procedures in conducting demonstrations; (3) to discuss the interpretation and presentation of results from demonstrations; and (4) to explain the use of demonstrations conducted within each dealer's trade territory as sales tools in selling fertilizer, herbicides and insecticides to farmers.

In addition to the discussion of long-range planning during the workshop, three days of follow-up training were spent on long-range planning with emphasis of systematic capital budgeting. The presentations on systematic capital budgeting centered on the fertilizer department. However, the general procedures were presented in a framework that would be applicable to other departments in the business. Iowa State University extension economists discussed the decision-making process, presented the economic aspects of capital budgeting and provided the dealers with forms and procedures for systematic capital budgeting. Fertilizer industry representatives discussed product trends and recent developments in the industry. A representative of the Tennessee Valley Authority discussed fertilizer facility and equipment alternatives. The major purpose of these

sessions was to provide the dealers with a systematic process and the data needed for evaluating and appraising alternatives involving capital expenditures.

Advertising, promotion and merchandising was the content for two of the follow-up training meetings. This content area was approached from the point of view of a retail dealer selling products to his present and potential customers. This material was presented by Iowa State University staff members from both the economics and journalism departments.

Product information about fertilizer and agricultural chemicals was presented at six of the follow-up training meetings. Iowa State University specialists presented the majority of this material emphasizing basic principles and current recommendations. Two fertilizer product information sessions were presented by representatives of the fertilizer industry. The first of these sessions was mentioned previously under systematic capital budgeting. The second session was held during the following year. The content area included the fertilizer industry, product trends and possible impacts of these developments on retail dealers.

In addition to these training meetings, the treatment dealers were also asked to attend the annual Iowa State University Fertilizer and Agricultural Chemicals short courses held in January of 1963. Each of the short courses was a day in length and they were held on consecutive days.

A less formal aspect of the training program was manager participation in the form of "idea exchanges", discussion sessions and a certain amount of "homework" which they were asked to complete in connection with certain training sessions. The "homework" consisted mainly of gathering data and information which were used as part of the systematic capital budgeting sessions.

At various times during the training program, including the training sessions and during interviewing, the treatment managers were given an opportunity to discuss and express their opinions concerning the content and type of training which they desired during the follow-up training period. Once a year, a three man executive committee, elected by the participating dealers, met with Iowa State University staff members to discuss and formulate plans for the follow-up training program during the next year.

Attendance of the treatment managers at these training meetings could not be made compulsory. It was realized that the managers might find some of the sessions outside their interest area. It was also recognized that, due to ongoing business activities, it would probably be impossible for certain

managers to leave their business on a given date to attend a training session even though their interest was high and they perceived the area to be relevant to their business. However, managers were strongly urged to attend all meetings and attendance was very high, especially considering it was not always possible to schedule the dates for meetings to avoid conflicts with business and other activities. Letters which discussed the purpose of each meeting and outlined the content areas and the time allocations were mailed to the managers prior to each training meeting. In all instances when a manager could not attend a particular training session, he was given the training materials used at the meeting and they were sometimes explained to him on an individual basis by a member of the training staff.

During the training period, the managers accumulated a set of printed materials from the presentations. By the completion of the training program they had in their possession four loose-leaf notebooks which could serve as handbooks for reference purposes. The materials in these notebooks included reproductions of meeting summaries, Iowa State University pamphlets and bulletins, correspondence concerning training activities, fertilizer and agricultural chemical industry publications, suggested work forms and any notes of materials the managers added themselves.*

Research Activities

General research activities included: (1) development of the research design; (2) periodic meetings of the research committee; (3) periodic construction of field instruments for interviewing treatment dealers, control dealers and farmers; (4) periodic administering of field instruments; (5) development of models for analysis of data; (6) development of codes for data; (7) coding, processing and analysis of data; and (8) preparation of preliminary reports on research data.

The members of the research committee were: Joe M. Bohlen, Rural Sociology, project co-leader; George M. Beal, Rural Sociology, project co-leader; Richard Phillips, Agricultural Economics (until February, 1962); C. Phillip Baumel, Agricultural Economics (after February 1, 1963); and Richard D. Warren, Rural

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*A complete set of materials given to the dealers in the training program is available on a loan basis from Department of Sociology and Anthropology, Iowa State University of Science and Technology, Ames, Iowa.

Sociology, project coordinator. James Hanson, Graduate Assistant in Rural Sociology, assisted with research activities during 1963-1964.

Design

The experimental design of this research project called for two groups of retail farm supply dealers. One group, the treatment group, was to participate in the training program conducted by Iowa State University. The dealers in this group were to attend the training sessions provided for them and it was assumed that they would be motivated to understand and use the material presented which they felt would be of value to them in their businesses. The other group of dealers was to be used as a control and did not participate in the training program conducted by Iowa State University.

The following general criteria were considered in the selection of dealers from which the treatment and control groups were chosen:

1. They should sell both fertilizer and agricultural chemicals.
2. They should have a fertilizer sales volume of $15,000 or over for 1960 (the year preceding the research study).
3. They should be general managers of established local retail farm supply businesses.
4. They should be willing to participate in a dealer training program.

In addition, it was decided that the businesses should be located in a similar type area, homogeneous as far as possible in regard to agronomic characteristics such as soil type and climate. It was also believed desirable to use dealers whose businesses were located in an area that was relatively homogeneous in regard to the type of farming and the present and potential use patterns of fertilizer and agricultural chemicals. Choosing dealers from such an area would make it possible to control a number of variables that might cause dealer differences.

The cash-grain area of north central Iowa meets these criteria for homogeneity. It is one of the major types of farming. By soil type classification it is the Clarion-Webster Soil Association. It is relatively homogeneous regarding agronomic characteristics such as soil type, climate and length of growing season. From this general area, a block of nine counties was selected. From this nine county area all of the retail farm supply dealers who met the general criteria for selection were interviewed in a reconnaissance survey. Fifty-four dealers met these criteria.

Selected variables were used to match eight pairs of dealers from this group of fifty-four dealers. The variables on which this selection and matching were based included: (1) major product line, (2) percent fertilizer volume was of total sales volume, (3) percent agricultural chemicals volume was of total sales volume, (4) total business volume, (5) fertilizer sales volume, (6) agricultural chemicals sales volume, (7) general manager's evaluation of the importance of fertilizer to the business, (8) general manager's perception of plans for the fertilizer department, (9) general manager's evaluation of the importance of agricultural chemicals to the business, (10) general manager's perception of plans for the agricultural chemical department, (11) number of years which general manager had sold fertilizer, (12) number of years which general manager had sold agricultural chemicals, (13) types of fertilizer sold, (14) number of employees, (15) general manager's years of formal education, and (16) general manager's age.

Another variable in the selection and matching of dealers was the general manager's stated willingness to participate in a dealer training program. A structured question was used. The general managers were asked to select from the five responses the one that best applied to their willingness to attend. Their responses were most certainly attend, certainly attend, probably attend, probably not attend, certainly not attend. The question was, "If you had an opportunity to attend a week long training program devoted to training in basic business management practices and sales techniques as well as product information on fertilizer and agricultural chemicals would you_____such a meeting?" In no case were dealers placed in a matched pair that differed more than one category in their response to this question.

It was also decided that in selecting matched pairs of dealers the overlap of trade territories would be kept at a minimum.

Using the selection variables listed, eight matched pairs of dealers were selected. They included one pair of Farm Service (Farm Bureau) Companies, one pair of family corporations, one pair of private corporations, one pair of line corporations (Quaker Oats) and four pairs of cooperatives based on the size of the business. A third alternate dealer was selected for six of the pairs. It was not possible to find alternates for two of the pairs in the total enumeration of 54 dealers.

One dealer was randomly chosen from each pair and designated as the treatment dealer. The other dealer in the pair was designated as the control dealer.

In one case the treatment dealer chosen could not participate in the first workshop because of long standing plans. The alternate dealer for that pair was designated as the treatment dealer and agreed to participate. Two additional alternate dealers requested to be included in the training and were included as alternate treatment dealers.

Thus, there were ten treatment and eight control managers, for a total of eight matched pairs, at the time the training started. For various reasons, but mainly due to change of managers within some of the businesses, there were only four matched pairs left intact at the end of the three year training period, although there was a total of eight treatment and five control managers still in the research project. The four intact pairs included one pair of Farm Service Companies and three pairs of cooperatives. The fifth control manager still in the research project was also a cooperative manager. The remaining four treatment managers included one alternate treatment cooperative, one privately owned business, and two line corporations (one of these being an alternate treatment dealer for the other).

During the three year experimental period, one private and one cooperative treatment manager and two private and one line corporation control managers changed positions. Thus, the inherent dangers of using experimental designs involving matched pairs, small numbers and extended time periods within a dynamic society are made manifest.

Data Collection

As a part of this research project certain information was collected from both the treatment and control general managers. This included: (1) the collection of financial and factual information about the general managers' businesses; (2) opinions on matters pertaining to their business operations; (3) answers to questions which would test dealers' knowledge and attitudes in the areas of management, fertilizer and agricultural chemicals; and (4) answers to questions pertaining to their actions and activities related to operational management.

The primary method of data collection was personal interviews with the general managers. Some information was obtained from both the treatment and control groups of general managers during the initial reconnaissance survey. The majority of the data was obtained in three intensive interviews. The first of these interviews was conducted in early 1961, shortly before the training program was started for the treatment dealers. An interim interview was

conducted in March, 1962, and the final data were obtained in the fall of 1963.

A random sample of farmers from the trade area of each treatment and control general manager was interviewed in 1961 to obtain information about: (1) use patterns for fertilizer and agricultural chemicals, (2) attitudes and opinions concerning fertilizer and agricultural chemicals, (3) farmers' information sources for fertilizer and agricultural chemicals, (4) farmers' expectations of their fertilizer and agricultural chemical dealers, (5) factors which farmers believe limit their use of fertilizer and agricultural chemicals, and (6) farmers' purchase patterns for fertilizer and agricultural chemicals.

Research Measures

General

The basic experimental design used in this study is of the before-after type. It consists of one treatment and one control group of dealers who were matched by pairs and from whom measures were obtained before and after the exposure of treatment dealers to the experimental or independent variable.

Some of the measures used to support hypotheses are questions which were asked of the dealers after the training program only. Again it is assumed that the test of significance will account for any chance amount of differences in answers not due to the training program. Since the matched pairs of dealers were selected on the basis of some similar characteristics, it is even more probable that the differences in after answers are due to the training program. Similarity of data derived from questions asked before in the same general area, even though the specific question was not asked before, would also help to establish an inferred benchmark and allow one to infer that differences in the dependent variable are a result of the training program.

Another measure of change is the dealers' perception of change that has taken place. Several of the questions were worded in such a way that the dealers could indicate on a continuum the degree of change which they perceived had taken place in themselves and within their businesses during the training period. The treatment dealers were also asked to indicate their perception of the effect of the training program on certain changes in themselves and their businesses.

Working with a small sample has some features which are not found in a large sample. One feature is the chance for personal acquaintance with the individual participant. In this project, some members of the research committee

became personally acquainted with the dealers. This acquaintance was made through the training sessions, through personal conversations with some of the dealers and through personal interviews. It was possible through interviewing both treatment and control dealers, to gain insights which were not recorded as formal measures. These types of "participant observer" insights can be useful in making inferences from dealers' actions or statements.

In summary, research measures included: (1) questions asked both treatment and control dealers before, interim and after the training period; (2) questions asked treatment dealers before and after training period; (3) questions asked both treatment and control dealers after the training period; (4) questions asked treatment dealers after training period; and (5) "participant observer" insights.

The following table is a summary of the various types of measures used in the study.

Table 1: Types of Measures Used

Measures	Dealers interviewed	Time Asked		
		Before (1961)	Interim (1962)	After (1963)
Interview schedules				
1	Treatment and Control	X	X	X
2	Treatment and Control	X		X
3	Treatment and Control		X	X
4	Treatment and Control			X
5	Treatment only (Evaluation)			X
Participant Observation				
6	Treatment and Control	X	X	X

Financial data-computations

Differences in the fiscal years of the general managers businesses and variations in bookkeeping systems required the collection of income and expense figures on a monthly basis as well as on a departmental and item breakdown. The original collection of data was on the basis of the fiscal year. Therefore, additional financial data had to be collected for all years during the 1963 interviewing. After the collection of the monthly data on a departmental and item basis, the financial data were adjusted: (1) to a common fiscal period

(calendar years) and (2) to reflect returns arising only from the operations of the business. The rationale and general procedures for making these adjustments are discussed by Baumel.* Essentially, the reason for adjusting economic data to a common fiscal period was to make the data comparable among firms. Other adjustments were made so that the measures reflected returns only from the operations of the business.

In addition to the adjustments necessary to adjust all financial statements to a common fiscal year period, the following adjustments or computations were made: (1) if not available, balance sheets for December 31, 1959, December 31, 1960, December 31, 1961, and December 31, 1962, were computed; (2) accelerated depreciation expenses were subtracted from production expenses so that all firms would have normal depreciation rates; (3) income taxes and interest expenses were subtracted from production expenses so that all firms would be more comparable; (4) patronage refunds, dividends and interest from outside investments were subtracted from income so that income reflected returns arising only from the business operations; (5) outside investments were subtracted from total tangible assets to obtain total tangible operating assets; and (6) the beginning and ending dollar values for each calendar year for various measures of assets were averaged to obtain a better estimate of the actual inputs.

After the adjustments were made, the following form was used to compute dollar values for income, expense and profit items for the total business for each calendar year (1960, 1961 and 1962).

1. Total gross commodity sales	_____	
2. Less Total cash discounts	_____	
3. Total Net commodity sales		_____
4. Less Total cost of goods sold	_____	
5. Total gross commodity margins		_____
6. Plus total net service income	_____	
7. Total net operating revenue		_____
8. Less Total production expense	_____	
9. Total net operating profit		_____

*Baumel, C. Phillip, Department of Economics, Iowa State University of Science and Technology, Ames, Iowa, was a member of the research team after 1963. Much of the following discussion outlines his recommendations for collection and analysis of the financial data.

The dollar values obtained for the various items on this form were used in constructing the various economic measures for the total business.

Similar adjustments were made for the financial statement and balance sheet items for the fertilizer and agricultural chemicals departments. In addition the income and expenses connected with soil insecticides sold in fertilizer was subtracted from the fertilizer department and added to the agricultural chemicals department. In allocating total production expenses to the fertilizer department, three basic procedures were used. First, for expenses such as depreciation, property taxes and insurance, the ratio of fertilizer fixed assets to total fixed assets was used. Second, for expenses such as utilities, travel and conventions, advertising, supplies, truck expenses, and repair and maintenance, estimates made by the general managers were used. Third, the ratio of fertilizer net revenue to total net operating revenue was used to obtain payroll expenses connected with the fertilizer department.

After the adjustments were made, the following form was used to compute dollar values for <u>income</u>, <u>expense</u> and <u>profit</u> items for the fertilizer department for each calendar year (1960, 1961 and 1962).

1.	Fertilizer gross sales	_____	
2.	Less cash discounts	_____	
3.	Fertilizer net sales		_____
4.	Less cost of goods sold	_____	
5.	Fertilizer gross margins		_____
6.	Plus net service income	_____	
7.	Fertilizer net revenue		_____
8.	Less fertilizer production expense	_____	
9.	Fertilizer net profit		_____

The items from this form used in constructing economic measures for the fertilizer department include: fertilizer net sales, fertilizer net revenue and fertilizer net profits.

Agricultural chemical net sales were adjusted to the common fiscal period (calendar years) by using monthly statements.

EXPERIMENTAL RESEARCH PROBLEMS

Conducting experimental research outside of controlled laboratory or classroom conditions presents several problems not encountered in more completely controlled situations. Events, time and activities have an influence on such research and may have an effect on the outcome of the experiment. One of the tasks of the researcher is to separate the effect of these uncontrolled happenings from the independent or casual variable. Yet, there are many types of research which must be conducted in the "field" in order to obtain desired information. There are certain controls which can be brought to bear in these situations so that the independent variable can be assessed.

In this study the experiment was designed in such a way that control was, to a large extent, built in. This was done by the following method: matched pairs of dealers were selected on a number of relevant characteristics obtained in a reconnaissance survey. Differences and similarities in dealers were determined before the treatment was applied and are used as a basis for determining future change. This aided in determining if changes resulting in the dependent variable were due to initial differences between the dealers. Matching as closely as possible on many characteristics also may make it possible to detect smaller effects of the independent variable, i.e., the training program.

From the matched pairs a random assignment was made as to which dealers should be in the treatment and control groups. The treatment dealers were then involved in the dealer training program conducted through Iowa State University, while no experimental treatment was given to the control dealers.

Since there was a time factor of about three years involved in the experimental research program, and since it was not possible to control other variables which may have influenced the dealers in regard to the dependent variable, it is recognized that there may have been change which cannot be attributed to the Iowa State University training program. However, it is assumed that, due to the nature of the experimental design, these other variables would be randomly distributed over both groups' dealers. It is assumed that the dealer training program is the unique variable which was applied to only the treatment dealers.

One other consideration should be kept in mind when measuring change which may have resulted from the training. In many cases, a large area of training is being measured with only a few empirical measures. In some instances, the results of training which took up to two days to present are being measured with one, two or three questions. This does not do justice to the subject matter

area nor to the specialist who taught that area. However, due to the wide range of subject matter and the large amount of material presented, there was no alternative but to limit the number of questions because of the time required to interview the dealers. Also, in many cases, only a few questions or items were used to measure areas of knowledge, attitudes, performance or business firm activities. It is only possible to ask a sample of all possible questions in a given area. Therefore, it is possible that the dealers made changes which the questions did not cover. Again, time and expense limited the number of questions.

Although there were certain statistical problems involved in measuring observations of a small sample size, there are several reasons which may be given in defense of the small sample size. As previously mentioned, the original experimental design included eight matched pairs of treatment and control dealers plus six alternate treatment dealers. Ten of these treatment dealers agreed to participate in the training program, including at least one in each matched pair. It was not possible to foresee that five of these dealers, at least one from each of four matched pairs, would not be in the study upon its completion. This drop-out meant that there were only four matched pairs of dealers intact at the end of the training period.

The purpose and design of the study was one reason for limiting the number of participants. The study is exploratory in nature, and so a large quantity of data was obtained and analyzed for each dealer. The training program itself covered about a two and one-half year period. And there were several intensive data gathering interviews with each dealer during that time period. Available sources limited the opportunity to gather and analyze the data from a greater number of participants, although the training sessions themselves could have included several times as many participants.

One of the advantages of selecting a relatively small number of dealers for this study was that the selection and matching of dealers from those meeting the original criteria could be more discriminatory. It was possible to match the dealers on more variables than would have been possible if a larger number of dealers had been matched. This means that the violation of normality in statistical analysis is less serious than if the dealers had been matched on fewer similar variables.

Since this study is exploratory in nature and was conducted using a small sample size, the results must be viewed in this perspective. It must also be recognized that there are some variables which cannot be controlled in a

"real-life" situation covering a relatively long-time span. It should be recognized that this sample does not represent the entire population of dealers, e.g., other groups of retail farm supply dealers in Iowa and other states, or retail dealers in other businesses.

FINDINGS - MATCHED PAIR

As previously mentioned, there were four matched pairs of managers intact at the end of the training period (June, 1963). Hence, attitude and knowledge data will be presented for four matched pairs of managers. Two of the managers not in the study at its completion were employed until January 1, 1963, or after. Therefore, economic data for the calendar years 1960, 1961 and 1962 are available for six pairs of managers.

Knowledge, Attitude and Perception - Four Matched Pairs

The t test for differences between means of paired observations will be used in the analysis of attitude and knowledge data. With small sample size, it was not expected that many statistically significant t's would be obtained. However, the t test does provide an objective means of evaluating the empirical hypotheses concerning the attitude and knowledge data.

Two types of empirical hypotheses are used in analysis concerning attitude and knowledge data: (1) For each empirical hypothesis which compares the treatment and control managers, the t test for means of paired observations will be used. A positive t value indicates the treatment managers' change scores were higher than the control managers' change scores. A negative t value indicates that the control managers' change scores were higher than the treatment managers' change scores. A zero t value indicates the change scores for both treatment and control managers were exactly the same. (2) The second type of empirical hypothesis concerns the treatment managers' perception of effect the training program had on certain changes that they indicated had taken place within themselves as managers and within their businesses. Since any value would indicate support of these empirical hypotheses, the mean score will be given as a measure of intensity of support.

Eight General Hypotheses

Based on data for four (4) pairs of managers, the following eight general hypotheses and a number of empirical hypotheses were tested and summary statements are made about the results.*

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*For specific concepts, operational measures used and more detailed discussion see: Roy E. Hougen, George M. Beal, Joe M. Bohlen and Richard D. Warren. The Experimental Dealer Training Program--Changes in Knowledge and Attitudes of Farm Supply Dealers. Rural Sociology Report No. 37. Department of Economics and Sociology, Iowa State University, Ames, Iowa. 1964.

1. Treatment managers will increase their knowledge of fertilizer to a greater extent than will control managers. (There appears to be a definite trend in favor of the treatment managers.)*

2. Treatment managers will change their attitudes toward fertilizer in predicted (and judged favorable) directions to a greater extent than will control managers. (There appears to be an apparent trend in favor of the treatment managers.)

3. Treatment managers will increase their knowledge of selling to a greater extent than will control managers. (There appears to be a trend in favor of the treatment managers.)

4. Treatment managers will change their attitudes toward selling in predicted directions to a greater extent than will control managers. (There appears to be a little trend in favor of the treatment managers.)

5. Treatment managers will increase their knowledge of their role with their farmer-customers to a greater extent than will control managers. (There appears to be a trend in favor of the treatment managers.)

6. Treatment managers will change their attitudes toward their role with their farmer customers in predicted directions to a greater extent than will control managers. (There is no apparent trend in the direction of either group of managers.)

7. Treatment managers will increase their knowledge of management to a greater extent than will control managers. (There appears to be a trend in favor of the treatment dealers.)

8. Treatment managers will change their attitudes toward management in predicted directions to a greater extent than will control managers. (There appears to be a definite trend in favor of the treatment managers.)

Individual Variables

The following is a summary of knowledge, attitude and perception variables

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*Under each of the general hypotheses, several specific empirical hypotheses were stated. Based on the t values for the specific hypothesis a general summary statement about trend will be made. When several of the t values are positive then definite trend will be used. If positive and negative t values are about equal, then no apparent trend will be used. Apparent trend, a trend and little trend will be used respectively for summary statements about trends from a definite trend to no apparent trend in descending order.

which were included in seventy-seven specific empirical hypotheses.*

For the following variables there was a statistical significant difference (based on the t test) between treatment and control managers in favor of treatment managers.

1. Knowledge of the major elements included in a planned fertilizer program.
2. Perception of importance of fertilizer to total business.
3. "General attitude toward fertilizer score."
4. Perception of increased confidence in selling fertilizer.
5. An understanding of the relationship of individual farmer's fertilizer and agricultural chemicals use to the surplus problem.
6. Knowledge of the concept of the present vs. future value of money.
7. Perception of increased confidence in making major decisions.

For the following variables there was a positive t value; i.e., the treatment managers changed more in the predicted (desired) direction than control managers.

1. "Fertilizer knowledge score".
2. "Demonstration purpose score".
3. Knowledge of the use of soil test reports.
4. Knowledge of the percent of farmers using fertilizer.
5. Knowledge of farmers' fertilizer expenditures.
6. Perception of increased understanding of potential fertilizer use.
7. Perception of increased understanding of the fertilizer industry.
8. Intensity of soil testing services.
9. Use of fertilizer clinics.
10. Assistance to farmers in planning fertilizer programs.
11. Perception of importance of fertilizer to farmers.
12. Fertilizer department expansion plans.
13. Perception of farmers' optimum fertilizer expenditures.
14. Perception of future fertilizer sales.
15. Planning and evaluating advertising programs.

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*Under each of the general hypotheses, several specific empirical hypotheses were stated. Based on the t values for the specific hypothesis a general summary statement about trend will be made. When several of the t values are positive then definite trend will be used. If positive and negative t values are about equal, then no apparent trend will be used. Apparent trend, a trend and little trend will be used respectively for summary statements about trends from a definite trend to no apparent trend in descending order.

16. Deciding advertising expenditures.
17. Determining merchandising services to offer.
18. Use of visual aids.
19. Perception of increased understanding of selling alternatives.
20. Knowledge of farmers' perception of factors limiting fertilizer use.
21. Perception of ability to handle farmers' problems and questions.
22. Perception of farmers' expectations of them as information sources.
23. Perception of increased understanding of farmers' expectations of them.
24. Perception of increased adequacy in providing information to farmers.
25. Perception of increased confidence in influencing attitude and understanding of farmers.
26. Perception of increased confidence in making recommendations on fertilizer to farmers.
27. Knowledge of the functions of management.
28. Perception of evaluating alternatives when making major decisions.
29. Consideration of profit maximization in deciding business lines.
30. Perception of increased understanding of product trends for fertilizer.
31. Consideration of cash needed vs. cash flow in borrowing capital.
32. Attitude toward learning economic principles.
33. Perception of increased confidence in managerial ability.

For the following variables there was a negative t value; i.e., control managers changed more than the treatment managers in the predicted (desired) direction.

1. Knowledge of present percent of optimum fertilizer use in Iowa.
2. Emphasis on soil testing program.
3. Intensity of planning and carrying out farmers' fertilizer programs.
4. Perception of importance of assistance to farmers in planning fertilizer programs.
5. Providing printed information on fertilizer to farmers.
6. Effort to compete in the fertilizer business.
7. The use of technically competent sources for ideas about fertilizer sales techniques.
8. "Progressivism scale".
9. Perception of increased understanding of social and economic situations of farmer-customers.
10. Communication concepts.
11. Perception of increased understanding of role with farmer-customers.
12. "Opinion leader index score".

13. Feeling toward providing technical information to farmers.
14. Perception of increased use of a systematic process in determining prices and margins.
15. Method used in considering fertilizer sales trends.
16. Understanding of plant and facility alternatives for fertilizer department.

For the following variables there was a zero t value; i.e., the (treatment and control) managers were the same.

1. Perception of responsibility to make fertilizer recommendations to farmers.
2. Knowledge of reasons limiting farmers' use of fertilizer.
3. Feeling qualified to provide information on fertilizer.
4. Margin determination score.
5. Understanding of the *decision-making process*.

Variables upon which the treatment managers perceived that the training program had an effect on their increased understanding or confidence.*

1. Perception of increased understanding of potential fertilizer use (3.50)** (Great).
2. Perception of increased understanding of the fertilizer industry (2.75) (Much).
3. Perception of increased understanding of the importance of fertilizer use to farmers (3.00) (Much).
4. Perception of increased understanding of the area of selling (2.00) (Some).
5. Perception of increased confidence in selling fertilizer (3.00) (Much).
6. Perception of increased understanding of the economic and social situation of farmer-customers (1.00) (Little).
7. Perception of increased ability to handle problems and questions from farmer-customers related to fertilizer and agricultural chemicals (2.75) (Much).
8. Perception of increased understanding of what farmers expect of you (2.75) (Much).
9. Perception of increased understanding of role with farmer-customers (2.25) (Some).

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*Scores for these variables:
0 = None
1 = Little
2 = Some
3 = Much
4 = Great

**Mean score for the four managers.

10. Perception of increased confidence in influencing attitude and understanding of farmers (2.75) (Much).
11. Perception of increased confidence in making recommendations on fertilizer to farmers (3.50) (Great).
12. Perception of increased use of a systematic process in determining prices and margins in reference to fertilizer and agricultural chemicals departments (0.75) (Little).
13. Perception of increased understanding of product trends for fertilizer (1.75) (Some).
14. Perception of increased understanding of plant and facility alternatives available for fertilizer department (2.25) (Some).
15. Perception of increased confidence in making major decisions (2.25) (Some).
16. Perception of increased confidence in managerial ability (2.25) (Some).

Economic Variables - Six Matched Pairs

Because the business firm has the goal of the production of goods and services, some economic measures of effectiveness and efficiency are desirable if the impact of a training program is to be assessed. Economic returns to the entire business in this study will be defined in terms of total net sales, total gross commodity margins, total net operating revenue, indicators of profit maximization and some of the more common ratios used for testing the profitability of the business firm. Economic returns to the fertilizer department will be defined in terms of fertilizer sales, tons of fertilizer sold, fertilizer gross margins, fertilizer net revenue, fertilizer net profit and fertilizer net profit divided by fertilizer fixed assets. Economic returns to the agricultural chemical department will be defined as agricultural chemicals net sales. The general computation procedures used and adjustments made were discussed in the financial data-computation section of this report, pages 24-29.

Total net commodity sales, in dollars, is used as a measure of the output of the business firm. Total gross commodity margins, in dollars, is used as a measure of the gross profits of the business firm. Total net operating revenue, in dollars, is used as a measure of the gross profits of the business firm.

Under various assumptions, measures of profit maximization have been derived from the theory of the firm by Baumel.* The number and type of variables, which

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*Baumel, C. Phillip, Department of Economics, Iowa State University of Science and Technology. Measures of Profit Maximization. Private Communication, 1965.

a general manager must take as given, determined which measure is appropriate. The three measures which appear appropriate for this study are ratio of total net operating profits to total tangible operating assets; ratio of total net operating profits to total fixed assets; and total net operating revenue. Ratio of total net operating profits to total tangible operating assets is used as a measure of the profit maximizing of a general manager who is given a fixed amount of capital and is able to make final decisions regarding both current and fixed inputs. Computation procedures for total net operating profits are discussed on pages 24-29. Total tangible operating assets are total tangible assets of the firm minus outside investments. Intangible assets include goodwill, ability to make profits, etc., for which it is difficult to assign dollar values. Therefore, only tangible assets will be considered in this study. This ratio is computed by dividing total net operating profits by total tangible operating assets. Ratio of total net operating profits to total fixed assets is used as a measure of the profit maximizing objective of a general manager who is able to change selected (current) inputs. Computation procedures used for total net operating profits are discussed on pages 24-29. Total fixed assets include land, plant and equipment. This ratio is computed by dividing total net operating profits by total fixed assets. Total net operating revenue is used as a measure of the profit maximizing objective of a general manager who must take all inputs as given. As mentioned earlier, it is also a measure of the gross profits of the business.

Some of the more common ratios used for testing the profitability of the business firm as related to sales are formed by expressing items on income statement as a percentage of net sales.* Three ratios were selected for use in this study: ratio of total gross commodity margins to total net commodity sales; ratio of total net operating revenue to total net commodity sales; and ratio of total net operating profits to total net commodity sales. These ratios were obtained by dividing each item by total net commodity sales.

Ratio of total production expense to total net commodity sales is used as a measure of the relationship between operating expense items and commodity sales. This ratio is computed by dividing total production expense by total

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*Schermerhorn, Richard W., Financial statement analysis for agricultural marketing firms. University of Maryland Cooperative Extension work in Agriculture and Home Economics Extension Service Pamphlet 24. 1964.

net commodity sales.

Fertilizer net sales, in dollars, is used as a measure of the output of the fertilizer department of the business. Tons of fertilizer sold is used as a measure of output in terms of number of tons of fertilizer sold by the business. Fertilizer net revenue, in dollars, is used as a measure of gross profits of the fertilizer department of the business. The computational procedures for fertilizer net sales and fertilizer net revenue were presented in the financial data-computation section of this report, pages 24-29.

Ratio of fertilizer net revenue to fertilizer fixed assets is used as a measure of the profit maximizing objective of a general manager who is able to change selected (current) inputs. Independence between the fertilizer operation and the other operations of the business is assumed for this measure. This ratio is computed by dividing fertilizer net revenue by fertilizer fixed assets.

Agricultural chemicals net sales, in dollars, is used as a measure of output of the agricultural chemical department of the business..

A summary on the various economic measures for six matched pairs of general managers is presented in Table 2. This summary is based on a comparison of percentage increase for each economic variable for each matched pair. For each general manager and for each economic variable, the 1961 value was divided by the 1960 value to determine the percentage. For each general manager and for each economic variable, the 1962 value was divided by the 1960 value to determine the percentage. The percentages for the two general managers within each of the six matched pairs were compared to determine which had increased more (or decreased less). It may be observed that for certain pairs on certain variables the designator "increase more" in the Table is actually "decreased less". Because of rounding and computational procedures used to adjust to common fiscal periods, a "tie" was given if the percentages were relatively similar (within 1-5 percent depending upon the variable) for two general managers within a pair. For example, two ties are recorded for total net commodity sales, 1961 versus 1960. In one of the ties the percent for the treatment general manager was 88.7 compared to 87.4 for the control general manager and in the other tie the percent for the treatment general manager was 92.3 compared to 94.1 for the control.

Only the number of treatment general managers who increased more and ties are presented. However, in all cases six matched pairs were included in the analyses. For total net commodity sales (1961 vs. 1960) four (4) treatment

general managers increased more and there were two (2) ties. Thus, none of the control general managers increased more than their match. However, for total net commodity sales (1962 vs. 1960) four (4) treatment general managers increased more and no ties are mentioned. Thus, two of the control general managers increased more than their respective matches.

Comparing 1961 to 1960, of the six matched pairs four or more of the treatment general managers increased more than their respective matches on ten of the fourteen economic measures reported in Table 2. Comparing 1962 to 1960, of the six matched pairs four or more of the treatment general managers increased more than their respective matches on eight of the fourteen economic measures. On four of the remaining six economic measures, it was an even division--three treatment general managers increased more than their respective matches and three treatment general managers increased less than their respective matches.

Table 2: Economic Measures for Six Match Pairs.

Variable	Years Compared	Comparison on Percent Increase (n=6)
Total Net Commodity Sales	1961 vs. 1960	Treatment managers increased more in 4 cases and 2 ties
	1962 vs. 1960	Treatment managers increased more in 4 cases
Total Gross Commodity Margins	1961 vs. 1960	Treatment managers increased more in 4 cases and 1 tie
	1962 vs. 1960	Treatment managers increased more in 4 cases
Total Net Operating Revenue	1961 vs. 1960	Treatment managers increased more in 4 cases and 1 tie
	1962 vs. 1960	Treatment managers increased more in 3 cases
Ratio of Total Net Operating Profits to Total Tangible Operating Assets	1961 vs. 1960	Treatment managers increased more in 5 cases
	1962 vs. 1960	Treatment managers increased more in 3 cases
Ratio of Total Net Operating Profits to Total Fixed Assets	1961 vs. 1960	Treatment managers increased more in 4 cases and 1 tie
	1962 vs. 1960	Treatment managers increased more in 3 cases

Continued

Table 2- Continued: Economic Measures for Six Match Pairs.

Variable	Years Compared	Comparison on Percent Increase (n=6)
Ratio of Total Gross Commodity Margin to Total Net Commodity Sales	1961 vs. 1960	Treatment managers increased more in 1 case and 3 ties
	1962 vs. 1960	Treatment managers increased more in 4 cases and 1 tie
Ratio of Total Net Operating Revenue to Total Net Commodity Sales	1961 vs. 1960	Treatment managers increased more in 1 case and 2 ties
	1962 vs. 1960	Treatment managers increased more in 2 cases and 2 ties
Ratio of Total Net Operating Profits to Total Net Commodity Sales	1961 vs. 1960	Treatment managers increased more in 5 cases
	1962 vs. 1960	Treatment managers increased more in 3 cases
Ratio of Total Production Expense to Total Net Commodity Sales	1961 vs. 1960	Treatment managers decreased more in 3 cases and 3 ties
	1962 vs. 1960	Treatment managers decreased more in 3 case and 2 ties
Fertilizer Net Sales	1961 vs. 1960	Treatment managers increased more in 5 cases
	1962 vs. 1960	Treatment managers increased more in 5 cases
Tons of Fertilizer Sold	1961 vs. 1960	Treatment managers increased more in 4 cases and 1 tie
	1962 vs. 1960	Treatment managers increased more in 4 cases
Fertilizer Net Revenue	1961 vs. 1960	Treatment managers increased more in 3 cases and 1 tie
	1962 vs. 1960	Treatment managers increased more in 5 cases
Ratio of Fertilizer Net Profit to Fertilizer Fixed Assets	1961 vs. 1960	Treatment managers increased more in 4 cases
	1962 vs. 1960	Treatment managers increased more in 5 cases
Agricultural Chemicals Net Sales	1961 vs. 1960	Treatment managers increased more in 4 cases
	1962 vs. 1960	Treatment managers increased more in 4 cases

FINDINGS - TREATMENT VERSUS CONTROL

As mentioned in the section on design of the experiment, only four matched pairs were intact at the end of the experiment. Various alternatives were considered to analyze the data collected on treatment and control general managers. Economic data were available through December 31, 1962, for nine treatment general managers and six control general managers. These data were obtained from business records. Therefore, even if the manager had left for another job in 1963, the data could still be obtained for the business and the manager had been responsible for the business during the specified period. On knowledge, attitude and performance variables, data were available for eight treatment dealers and five control dealers. This is the number of general managers interviewed during the 1963 interviewing.

Some of the analyses alternatives considered were: (1) analyze noneconomic variables for the four intact pairs remaining in the fall of 1963 and analyze the economic variables for the six intact pairs remaining December 31, 1962 (this analysis appears in previous section-findings matched pair); (2) assume a design with two groups without matching of pairs and analyze data on noneconomic variables for eight treatment and five control and on economic variables for nine treatment and six control; (3) use statistical tests for analyzing the data for either alternative 1 or 2; (4) use no statistical tests and present only descriptive findings for either alternative 1 or 2. For this section, it was decided to use statistical tests for the majority of variables and to basically use a design with two groups without matching of pairs. A section on economic variables, using a descriptive approach will also be presented. Some reasons for using statistical tests and assuming this design are presented in the following paragraphs.

As pointed out in the design of experiment section, an attempt was made to control on several environmental variables such as type of farming area, present and potential fertilizer use and agronomic characteristics. Therefore, whether one uses an experimental design with matched pairs or one without matched pairs, certain environment variables should be "relatively similar" for both treatment and control general managers.

The four general criteria used as the basis for a general manager to be included in the study either as a treatment or control narrowed the range of possible general managers for treatment and control general managers. From the matched pairs, a random assignment was made as to which dealers should be in the

treatment and the control groups. Therefore, the managers in treatment and control groups should be "relatively similar". It is realized that a manager leaving one of the groups during the period of the training program may lead to a difference in the two groups. Therefore, when possible, a statistical test was made on beginning benchmark (before) variables to give an indication whether or not the two groups to be analyzed are different when the matching is ignored.

Certain techniques will also be used to, in part, "control" for beginning differences even though these differences between groups are not statistically significant. The scoring on certain variables will be based on (1) whether a change or no change was made and (2) on the amount of change, if any, that was made. When the assumptions for covariance can be approximately met, analysis of covariance can be used to "control" on beginning differences. When pairing is based on several characteristics, there is difficulty in finding an "ideal" matched pair. If the assumptions can be approximately met, analysis of covariance is sometimes used to control on beginning differences.

For knowledge, attitude and performance variables the statistical tests are based on data for eight treatment and five control general managers. For economic variables, the statistical tests are based on economic data for nine treatment and six control general managers.

The variables included in this section are: (1) selected variables from the previous section, (2) variables from the previous section which have been reclassified and rescored, and (3) variables not included in the previous section. For certain variables the reported results in this section may not be the same as in the previous section. One of the major reasons for these differences is the difference in size of the treatment and control groups. For instance, in the previous section on knowledge, attitudes and perception variables, four treatment managers were compared with four control managers. In this section on knowledge, attitudes and perception variables, eight treatment managers are compared with five control managers. Another reason is that certain of the variables used as knowledge variables in the previous section are now classified as performance or firm variables. As a result of viewing the variable from a performance standpoint rather than knowledge standpoint, the scoring procedures were changed. Another reason is that as a result of a different method of scoring and/or the use of a design without matching, a different statistical test was employed.

The following summary is based on empirical hypotheses tested using the statistical test which seems to be the most appropriate for the type of measure.*

Knowledge

The empirical hypotheses which were given statistical support included the following variables:

1. Knowledge of the major elements included in a planned fertilizer program (.05 level). Approximately 88 percent of the treatment general managers had fertilizer program scores of 4 or more compared to 20 percent of the control general managers.

2. Knowledge of the concept of the present versus future value of money (.05 level). Approximately 62 percent of the treatment general managers had present value of money scores of 2 or more compared to none of the control general managers.

3. Knowledge of farmers' perceptions of factors limiting fertilizer use (.10 level). Seventy-five percent of the treatment managers had limiting factors scores of 9 or more compared to 20 percent of the control general managers.

The measures for which the trend was in favor of the treatment general managers, although the statistical test was not significant, included:

1. Fertilizer principles knowledge score (50 percent of treatment general managers increased their scores compared to 20 percent of control general managers).

2. Demonstration purpose score (50 percent of treatment general managers had scores of 3 or more compared to 20 percent of control general managers).

3. Chemical principles knowledge score (50 percent of the treatment general managers increased their scores compared to 20 percent of control general managers).

4. Farmers' expectations of agricultural chemicals dealer as a source of information (25 percent of treatment general managers increased their scores compared to the control general managers).

5. Knowledge of the functions of management (approximately 88 percent of treatment general managers identified 3 or more functions compared to 40 percent of control general managers).

Given the unequal group size and some chance deviation, the two variables for which the trend was not in favor of either treatment or control managers

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*For specific concepts, empirical measures used and more detailed discussion see, "The Influence of a Dealer Training Program", Richard D. Warren. Unpublished Ph. D. Thesis, Ames, Iowa. Library, Iowa State University of Science and Technology. 1965.

were:

1. Farmers' expectations of fertilizer dealer as a source of information (75 percent of treatment general managers increased their score compared to 80 percent of control general managers).

2. Margin determination score (50 percent of the treatment general managers had scores of 4 or more compared to 60 percent of control general managers).

The variable for which the trend was in favor of the control general managers was potential fertilizer use score. Eighty percent of the control general managers selected the correct answer compared to approximately 38 percent of the treatment general managers.

Attitudes

The empirical hypotheses which were given statistical support included the following variables:

1. Perception of increased adequacy in providing fertilizer information to farmers (.05 level). (100 percent of treatment general managers increased their scores compared to 40 percent of control general managers).

2. Attitude toward learning economic principles index (approximately 88 percent of treatment general managers had scores of 2 and over compared to 20 percent of control general managers).

3. Perceived importance of fertilizer department to total business (50 percent of treatment general managers increased their scores compared to none of the control general managers).

The two variables for which the trend was in favor of the treatment general managers were:

1. Perceived importance of agricultural chemicals department to total business. Approximately 38 percent of treatment general managers increased their scores compared to none of the control general managers.

2. Perception of increased adequacy in providing chemical information to farmers. Approximately 63 percent of treatment general managers increased their scores compared to 20 percent of control general managers.

Given the unequal group size and some chance deviation (probability between .39-.61) the ~~nine~~ ten variables for which the trend was not in favor of either treatment or control managers included:

1. General attitudes toward fertilizer score (50 percent of treatment general managers increased their scores compared to 40 percent of the control general managers).

2. Perceived importance of planning farmer fertilizer programs to business success (62.5 percent of treatment general managers had the score of 3 compared to 60 percent of the control general managers).

3. Perception of responsibility of fertilizer dealer in making recommendations about fertilizer use to farmers (100 percent of treatment general managers had the score of 3 compared to 80 percent of the control general managers).

4. Perception of responsibility of fertilizer dealer in providing technical fertilizer information (62.5 percent of treatment general managers had the score of 4 compared to 80 percent of the control general managers).

5. Perception of responsibility of agricultural chemical dealer in providing technical agricultural chemicals information (62.5 percent of treatment general managers had the score of 4 compared to 60 percent of control general managers).

6. Perceived importance of planning farmer fertilizer programs (62.5 percent of treatment general managers had the score of 3 compared to 80 percent of the control general managers).

7. Perception of responsibility of agricultural chemical dealer in making recommendations about agricultural chemicals use to farmers (62.5 percent of treatment general managers had the score of 3 compared to 80 percent of the control general managers).

8. Perceived qualification to provide fertilizer information compared to perceived qualification in other product lines (87.5 percent of treatment general managers increased their scores compared to 80 percent of control general managers).

9. Perceived qualification to provide agricultural chemicals information compared to perceived qualification in other product lines (50 percent of treatment general managers increased their scores compared to 60 percent of the control general managers).

10. Progressivism scale (50 percent of treatment general managers increased their scores compared to 40 percent of control general managers).

Two variables which were statistically significant in favor of the control general managers were:

1. Opinion leadership (fertilizer) index (.10 level). (The mean for the treatment general managers decreased from 14.38 in 1961 to 13.50 in 1963, whereas the mean for the control general managers increased from 11.80 in 1961 to 13.20 in 1963).

2. Opinion leadership (agricultural chemicals) index (.05 level). (The mean for the treatment general managers decreased from 12.88 in 1961 to 11.88 in 1963, whereas the mean for the control general managers increased from 12.80 in 1961 to 14.60 in 1963).

Operational Management (Performance) Variables

Only one of the empirical hypotheses was given statistical support (significant at .10 level). The variable included in this hypothesis was procedures used in allocation of advertising funds.

In a descriptive framework, the mean score for the treatment general managers was larger than the mean score for the control general managers on the following variables:

1. Procedures used for implementation of decisions.
2. Procedures used in planning advertising programs.
3. Procedures used in assigning responsibilities and work loads for employees.
4. Present use of wholesale salesman.
5. Procedures used in credit management.
6. Perception of change in emphasis concerning soil testing services.
7. Intensity of soil testing services.
8. Perception of change in emphasis concerning educational activities connected with fertilizer department.
9. Perception of change in emphasis concerning advertising and promotional activities connected with the fertilizer department.
10. Perception of change in emphasis concerning discount practices connected with fertilizer department.
11. Perception of change in emphasis concerning direct selling activities connected with fertilizer department.
12. Procedures used in evaluation of decisions.

The reader is reminded that some of the differences in mean scores were very small and this discussion is being presented in a descriptive framework because of the small sample size and exploratory nature of the project.

An additional variable for which the trend was in favor of treatment general managers was: factors considered in inventory management (75 percent of the treatment general managers had scores of 2 or more compared to 40 percent of control general managers).

Given the unequal group size and some chance deviation, the trend was not in favor of either the treatment or control general managers for the following variables:

1. Method used in considering fertilizer sales trends (75 percent of the treatment general managers had scores of 2 and over compared to 60 percent of control general managers).
2. Method used in making major decisions (50 percent of the treatment general managers had scores of 6 or more compared to 40 percent of the control general managers).

3. Factors considered in planning approach to customers (approximately 63 percent of the treatment general managers had scores of 4 or more compared to 60 percent of the control general managers).

4. Factors considered in the selection of supplier (25 percent of the treatment general managers increased their scores compared to 20 percent of the control general managers).

The variables for which the trend was in favor of the control general managers were:

1. Intensity of planning and carrying out farmers' fertilizer program (the mean score for the control general managers was higher than for the treatment general managers' score).

2. Methods used to train and develop employees (the mean score for the control general managers was higher than for the treatment general managers).

General Management and Firm Variables

The empirical hypotheses which were given statistical support included the following variables:

1. Use of efficiency ratios (.05 level). The mean score for the treatment general managers was larger than the mean score for the control general managers.

2. Procedures used for formulation of replacement and repair policies for facilities and equipment (.10 level). The mean for the treatment general managers was larger than the mean score for the control general managers.

3. Factors considered in determining product lines (.10 level). Fifty percent of the treatment general managers had scores of 3 and over compared to none of the control general managers.

4. Factors considered in determining capital requirements (.10 level). Fifty percent of the treatment general managers had scores of 3 and over compared to none of the control general managers.

The variables for which the trend was in favor of the treatment general managers were:

1. Expansion plans for fertilizer department. Approximately 38 percent of the treatment general managers increased their scores compared to none of the control general managers.

2. Total fixed assets. For the treatment general managers the 1961 mean for total fixed assets was 104.5 percent of the 1960 mean as compared to 99.7 percent for the control general managers; the 1962 mean for total fixed assets was 102.2 percent of the 1960 mean as compared to 98.4 percent for the control general managers; and the average mean (1961 + 1962) for total fixed assets was 103.3 percent of the 1960 mean as compared to 99.1 percent for the control general managers.

3. Fertilizer fixed assets. For the treatment general managers the 1961 mean for fertilizer fixed assets was 118.3 percent of the 1960 mean as compared to 104.8 percent for the control general managers; the 1962 mean for fertilizer fixed assets was 124.6 percent of the 1960 mean as compared to 90.4 percent for the control general managers; and the average mean (1961 + 1962) for fertilizer fixed assets was 121.5 percent of the 1960 mean as compared to 97.6 percent for the control general managers.

4. Fertilizer application services. The mean score for the treatment general managers increased from 0.88 in 1961 to 5.88 in 1963 compared to an increase of 3.20 in 1961 to 5.00 in 1963 for the control general managers. The mean scores were computed on the difference between services provided in 1960 versus 1961 and 1960 versus 1963. The general managers' perception of the change in emphasis placed on the fertilizer application services was also considered in calculating the score.

The variable for which the trend was not in favor of either treatment or control general managers was perception of how hard competing for fertilizer business in their trade area. (87.5 percent of the treatment general managers increased their scores compared to 80 percent of the control general managers.) Given unequal sample size, these percentages are approximately equal.

The variables for which the trend was in favor of the control general managers were:

1. Procedures used in determining merchandising services to offer. Although the adjusted means were not significantly different, the control general managers started with a lower mean score and increased their mean score; whereas, the treatment general managers decreased their mean score.

2. Perception of how hard competing for agricultural chemical business in trade area. One hundred percent of the control general managers increased their scores compared to 50 percent of the treatment general managers.

Economic Variables

None of the empirical hypotheses were given statistical support at either the .05 level of probability or .10 level of probability.

In order to determine if any trend exists, a descriptive approach will be used. The means for the different variables will be presented as well as the percent increase in means. The reader is cautioned that a significant difference was not detected by the statistical tests at the stated probability level.

The economic variables and computational procedures were discussed in the financial data-computation section, pages 24-29 and economic variables-six matched pair, pages 35-39.

In Table 3 the means for the treatment general managers (average for 9 businesses), control general managers (average for 6 businesses), and total (average for all 15 businesses in the study) are presented.

Table 3: Means for Economic Variables

Variable	Year	Treatment	Control	Total
Total Net Commodity Sales	1960	$777,948	$1,230,141	$ 958,825
	1961	778,847	1,214,380	953,060
	1962	864,126	1,313,580	1,043,907
	Average $\frac{(1961 + 1962)}{2}$	821,486	1,263,980	998,484
Total Gross Commodity Margins	1960	54,355	117,236	79,507
	1961	66,349	132,294	92,727
	1962	75,123	122,139	93,929
	Average $\frac{(1961 + 1962)}{2}$	70,736	127,216	93,328
Total Net Operating Revenue	1960	113,531	208,240	151,415
	1961	117,712	206,603	153,268
	1962	117,895	202,341	151,674
	Average $\frac{(1961 + 1962)}{2}$	117,804	204,472	152,471
Ratio of Total Net Operating Profits to Total Tangible Operating Assets	1960	.06860	.12065	.08942
	1961	.07541	.09592	.08361
	1962	.07352	.07827	.07542
	Average $\frac{(1961 + 1962)}{2}$	.07446	.08710	.07952
Ratio of Total Net Operating Profits to Total Fixed Assets	1960	.15410	.24152	.18907
	1961	.20157	.19967	.20081
	1962	.22200	.16553	.19941
	Average $\frac{(1961 + 1962)}{2}$	.21178	.18260	.20011
Ratio of Total Gross Commodity Margin to Total Net Commodity Sales	1960	.07651	.09147	.08249
	1961	.08831	.10400	.09459
	1962	.09251	.09178	.09222
	Average $\frac{(1961 + 1962)}{2}$	.09041	.09789	.09340
Ratio of Total Net Operating Revenue to Total Net Commodity Sales	1960	.14098	.15978	.14850
	1961	.14714	.16308	.15352
	1962	.13644	.14885	.14141
	Average $\frac{(1961 + 1962)}{2}$	.14179	.15596	.14746

Continued

Table 3: Continued - Means for Economic Variables

Variable	Year	Treatment	Control	Total
Ratio of Total Net Operating Profits to Total Net Commodity Sales	1960	.02539	.04843	.03461
	1961	.02418	.04250	.03151
	1962	.01969	.03373	.02531
	Average $\frac{(1961 + 1962)}{2}$	.02194	.03812	.02841
Ratio of Total Production Expense to Total Net Commodity Sales	1960	.11560	.11133	.11389
	1961	.12299	.12055	.12201
	1962	.11674	.11512	.11609
	Average $\frac{(1961 + 1962)}{2}$	.11986	.11783	.11905
Fertilizer Net Sales	1960	$ 65,618	$86,705	$74,053
	1961	75,184	84,457	78,894
	1962	93,202	97,573	94,950
	Average $\frac{(1961 + 1962)}{2}$	84,193	91,015	86,922
Tons of Fertilizer Sold	1960	842	1,269	1,013
	1961	994	1,266	1,103
	1962	1,211	1,409	1,290
	Average $\frac{(1961 + 1962)}{2}$	1,102	1,338	1,196
Fertilizer Net Revenue	1960	$ 10,898	$12,837	$11,673
	1961	12,778	13,700	13,147
	1962	16,826	14,191	15,772
	Average $\frac{(1961 + 1962)}{2}$	14,802	13,946	14,460
Ratio of Fertilizer Net Profit to Fertilizer Fixed Assets	1960	.41962	.16407	.31740
	1961	.36224	.11170	.26203
	1962	.24031	.10935	.18793
	Average $\frac{(1961 + 1962)}{2}$	.30128	.11053	.22498
Agricultural Chemicals Net Sales	1960	$ 4,546	$ 6,660	$ 5,392
	1961	6,881	8,680	7,601
	1962	6,772	8,087	7,298
	Average $\frac{(1961 + 1962)}{2}$	6,826	8,384	7,450

The 1961 mean was divided by the beginning (1960) mean to determine what percent the 1961 mean was of the beginning mean; the 1962 mean will be divided by the beginning (1960) mean to determine what percent the 1962 mean was of the beginning mean; and the average mean $\frac{(1961 + 1962)}{2}$ will be divided by the beginning (1960) mean to determine what percent the average mean was of the beginning

mean. The results of these calculations are presented in Table 4.

Table 4: Change in Means for Economic Variables on a Percentage Basis

Variable	Years Compared	Treatment (%)	Control (%)	Total (%)
Total Net Commodity Sales	1961 vs. 1960	100.115	98.718	99.398
	1962 vs. 1960	111.077	106.782	108.873
	$\frac{1961 + 1962}{2}$ vs. 1960	105.596	102.750	104.136
Total Gross Commodity Margins	1961 vs. 1960	122.066	112.844	116.627
	1962 vs. 1960	138.208	104.182	118.139
	$\frac{1961 + 1962}{2}$ vs. 1960	130.137	108.512	117.383
Total Net Operating Revenue	1961 vs. 1960	103.682	99.213	101.223
	1962 vs. 1960	103.843	97.167	100.171
	$\frac{1961 + 1962}{2}$ vs. 1960	103.763	98.190	100.697
Ratio of Total Net Operating Profits to Total Tangible Operating Assets	1961 vs. 1960	109.927	79.502	93.502
	1962 vs. 1960	107.172	64.873	84.343
	$\frac{1961 + 1962}{2}$ vs. 1960	108.542	72.192	88.928
Ratio of Total Net Operating Profits to Total Fixed Assets	1961 vs. 1960	130.804	82.672	106.209
	1962 vs. 1960	144.062	68.536	105.468
	$\frac{1961 + 1962}{2}$ vs. 1960	137.430	75.604	105.839
Ratio of Total Gross Commodity Margin to Total Net Commodity Sales	1961 vs. 1960	115.422	113.698	114.668
	1962 vs. 1960	120.912	100.338	111.795
	$\frac{1961 + 1962}{2}$ vs. 1960	118.167	107.018	113.225
Ratio of Total Net Operating Revenue to Total Net Commodity Sales	1961 vs. 1960	104.369	102.065	103.380
	1962 vs. 1960	96.779	93.159	95.225
	$\frac{1961 + 1962}{2}$ vs. 1960	100.574	97.609	99.299
Ratio of Total Net Operating Profits to Total Net Commodity Sales	1961 vs. 1960	95.234	87.755	91.043
	1962 vs. 1960	77.550	69.646	73.129
	$\frac{1961 + 1962}{2}$ vs. 1960	86.411	78.711	82.086

Continued

Table 4 Continued: Change in Means for Economic Variables on a Percentage Basis

Variable	Years Compared	Treatment (%)	Control (%)	Total (%)
Ratio of Total Production Expense to Total Net Commodity Sales	1961 vs. 1960	106.392	108.281	107.129
	1962 vs. 1960	100.986	103.404	101.931
	$\frac{1961 + 1962}{2}$ vs. 1960	103.685	105.838	104.530
Fertilizer Net Sales	1961 vs. 1960	114.578	97.407	106.537
	1962 vs. 1960	142.037	112.534	128.218
	$\frac{1961 + 1962}{2}$ vs. 1960	128.307	104.970	117.378
Tons of Fertilizer Sold	1961 vs. 1960	118.052	99.763	108.884
	1962 vs. 1960	143.824	111.032	127.344
	$\frac{1961 + 1962}{2}$ vs. 1960	130.878	105.437	118.065
Fertilizer Net Revenue	1961 vs. 1960	117.250	106.722	112.627
	1962 vs. 1960	154.395	110.547	135.115
	$\frac{1961 + 1962}{2}$ vs. 1960	135.823	108.639	123.875
Ratio of Fertilizer Net Profit to Fertilizer Fixed Assets	1961 vs. 1960	86.325	68.080	82.555
	1962 vs. 1960	57.268	66.648	59.209
	$\frac{1961 + 1962}{2}$ vs. 1960	71.798	67.367	70.882
Agricultural Chemicals Net Sales	1961 vs. 1960	151.363	130.330	140.968
	1962 vs. 1960	148.966	121.426	135.348
	$\frac{1961 + 1962}{2}$ vs. 1960	150.153	125.885	138.167

For the output variables which included total net commodity sales, fertilizer net sales, tons of fertilizer sold and agricultural chemical net sales the treatment general managers had a "higher percentage increase" than the control general managers for all three mean comparison - 1961 vs. 1960, 1962 vs. 1960 and average mean vs. 1960.

For the gross profit variables, which included total gross commodity margins, total net operating revenue and fertilizer net revenue, the treatment general managers had a "higher percentage increase" than the control general managers for all three mean comparisons - 1961 vs. 1960, 1962 vs. 1960 and average mean vs. 1960. For the control general managers the total net operating revenue means for 1961, 1962 and the average were less than the 1960 mean.

The measures of profit maximization derived from the theory of the firm included: total net operating revenue (also a measure of gross profits of business) for a manager with all inputs given, ratio of total net operating profits to total tangible operating assets (manager who is given fixed amount of capital and can make decisions regarding both current and fixed inputs), ratio of total operating profits to total fixed assets (manager who can change selected "current" inputs) and ratio of fertilizer net revenue to fertilizer fixed assets (manager who can change selected "current" inputs). The treatment general managers increased their 1961, 1962 and average means over the 1960 mean for total net operating revenue, ratio of total net operating profits to total tangible operating assets and ratio of total net operating profits to total fixed assets. For these three variables the 1961, 1962 and average means were less than the 1960 mean for the control general managers. The 1961, 1962 and average means for ratio of fertilizer net profit to fertilizer fixed assets was less than the 1960 mean for both the treatment and control general managers. The 1961 mean for treatment general manager for this ratio was a larger percentage of the 1960 mean than was the 1961 mean of the 1960 mean for control general managers. The average mean for the treatment general managers was a larger percentage of the 1960 mean than was average mean of the 1960 mean for control general managers.

For the common ratios used in testing the profitability of the business firm as related to sales, the treatment general managers had a higher percentage increase (or lower percentage decrease) than the control general managers for all three mean comparisons-1961 vs. 1960, 1962 vs. 1960 and average mean vs. 1960.

The 1961, 1962 and average means for ratio of total production expense to total net commodity sales increased less on a percentage basis for the treatment general managers than for the control general managers. This variable reflects the relation of production costs to sales.

Although the hypotheses concerning economic variables were not given statistical support, there appears to be a trend in favor of the treatment general managers.

General Managers' Perceptions

Two additional types of measures of change were asked the treatment and control general managers. One of these measures of change is the general manager's

perception of the change that had taken place during the training period. Several items were worded in such a way that the general managers could indicate on a "continuum" the degree of change which they perceived had taken place in themselves and within their businesses during the training period. These items were asked of both the treatment and control general managers. Certain of these items were included in the matched pair analysis and statistical tests made. However, no statistical tests were made for any of these items in the present treatment versus control analysis. The "continuum" and scoring for these items was: none = 0, little = 1, some = 2, much = 3 and very much = 4. The items and average responses for treatment and control general managers are presented in Table 5.

After the treatment general managers had indicated the amount of change for the items, they were asked to give their perception of the effect of the training program, if any, on the changes made. The question asked was: "What effect did the training program have on this change?" The "continuum" and scoring for this part follows: none = 0, little = 1, some = 2, much = 3 and great = 4. Their average response to each item is presented in Table 5.

Table 5: General Managers' Perception of Change and Treatment
General Managers' Perception of Influence of Training Program on Changes

	Perception of Change		Perception of Influence of Training Program
	Treatment (n=8) Average	Control (n=5) Average	Treatment (n=8) Average
During the past three years to what extent have you...			
...increased your understanding of the potential for fertilizer	3.38 (Much)	2.40 (Some)	3.25 (Much)
...increased your understanding of the fertilizer industry	3.38 (Much)	2.80 (Much)	2.88 (Much)
...increased your understanding of product trends for fertilizer	2.38 (Some)	1.20 (Little)	2.12 (Some)

Continued

Table 5-Continued: General Managers' Perception of Change and Treatment
General Managers' Perception of Influence of Training Program on Changes

	Perception of Change		Perception of Influence of Training Program
	Treatment (n=8) Average	Control (n=5) Average	Treatment (n=8) Average
During the past three years to what extent have you...			
...increased your understanding of the procedures for conducting demonstrations	2.62 (Much)	0.60 (Little)	2.75 (Some)
...increased your understanding of your role with your farmer customers	2.50 (Some, much)	2.00 (Some)	2.38 (Some)
...increased your understanding of what farmers expect of you as a fertilizer dealer	3.00 (Much)	1.80 (Some)	3.00 (Much)
...increased your understanding of the economic and social situation of your farmer customers	2.12 (Some)	2.00 (Some)	1.25 (Little)
...increased your understanding of what should go into planning fertilizer programs for farmers	2.75 (Much)	2.20 (Some)	2.88 (Much)
...increased your understanding of plant and facility alternatives available for your fertilizer department	2.75 (Much)	2.80 (Much)	2.12 (Some)
...increased your understanding of merchandising, promotional and advertising alternatives for your business	2.12 (Some)	1.00 (Little)	1.88 (Some)
...increased your understanding of product trends for agricultural chemicals	1.75 (Some)	1.20 (Little)	1.62 (Some)
...increased your confidence in selling fertilizer	3.12 (Much)	2.00 (Some)	3.00 (Much)

Continued

Table 5 - Continued: General Managers' Perception of Change and Treatment
General Managers' Perception of Influence of Training Program on Changes

	Perception of Change		Perception of Influence of Training Program
	Treatment (n=8) Average	Control (n=5) Average	Treatment (n=8) Average
During the past three years to what extent have you...			
...increased your ideas about the importance of fertilizer use for farmers	3.25 (Much)	2.40 (Some)	3.25 (Much)
...increased your confidence in making recommendations on fertilizer to farmers	3.62 (Very, Much)	2.60 (Much)	3.50 (Much, Great)
...increased your confidence in making recommendations on agricultural chemicals to farmers	2.62 (Much)	2.00 (Some)	2.38 (Some)
...increased your ideas about the importance of agricultural chemicals use for farmers	2.75 (Much)	2.20 (Some)	2.62 (Much)
...increased your confidence in making major decisions	3.00 (Much)	1.80 (Some)	2.38 (Some)
...increased your confidence in your managerial ability	2.12 (Some)	1.60 (Some)	1.88 (Some)
...increased your confidence in attempting to influence attitudes and understanding of farmers	2.88 (Much)	2.40 (Some)	2.75 (Much)
...increased your analysis of various alternatives for your business	1.88 (Some)	1.80 (Some)	1.75 (Some)
...increased your effectiveness in making and carrying out decisions related to your business	2.25 (Some)	1.60 (Some)	2.00 (Some)
...increased your analysis of your fertilizer trade area in the areas of trend, competition, factors related to sales and use and potential	2.50 (Some, Much)	1.60 (Some)	2.50 (Some, Much)

Continued

Table 5 - Continued: General Managers' Perception of Change and Treatment General Managers' Perception of Influence of Training Program on Changes

	Perception of Change		Perception of Influence of Training Program
	Treatment (n=8) Average	Control (n=5) Average	Treatment (n=8) Average
During the past three years to what extent have you...			
...increased your use of a systematic process in determining prices and margins in reference to your fertilizer and agricultural chemicals department	1.12 (Little)	1.20 (Little)	0.88 (Little)
...improved your communications with your employees	2.00 (Some)	1.20 (Little)	1.75 (Some)
...increased your ability to handle problems and questions from your farmer customers related to fertilizer and agricultural chemicals	2.88 (Much)	2.20 (Some)	3.00 (Much)
...increased your effectiveness in motivating and influencing your farmer customers	2.25 (Some)	1.80 (Some)	2.38 (Some)
...increased your use of Iowa State University recommendations in supplying information and giving advice to your farmer customers about fertilizer and agricultural chemicals	3.12 (Much)	2.40 (Some)	3.00 (Much)
...increased your confidence in using Iowa State University extension specialists for advice about your business operations	2.62 (Much)	1.20 (Little)	3.00 (Much)
...increased your understanding about how Iowa State University makes recommendations	3.38 (Much)	1.80 (Some)	3.38 (Much)

SUMMARY

This monograph reports the findings of a study to determine the influence of an intensive training program for general managers of local retail farm supply businesses for which fertilizer and agricultural chemicals were product lines. An attempt was made to determine changes in: 1) general managers' knowledge; 2) general managers' attitudes; 3) general managers' performance; 4) internal environment and activities of the business firm; and 5) economic returns of the total (entire) business, the fertilizer department and agricultural chemicals department. To accomplish this purpose the problem setting was described, the objectives and content areas of the training program were reviewed, changes in the above areas were predicted and an attempt was made to measure the changes. The specific objectives were to:

1. Determine the magnitude of predicted behavioral changes made by the general managers of local retail farm supply businesses as a result of participation in an intensive training program.

2. Determine the magnitude of predicted changes in selected internal environmental and activity business firm variables.

3. Determine the magnitude of predicted changes in selected business firm economic return variables.

4. Determine the magnitude of predicted changes in selected business firm intervening and economic variables in the fertilizer department and agricultural chemicals department.

When a training program has been adequately conducted, the expectation is that the experience will modify the behavior of the persons trained. If the training is conducted for persons who are members of business firms, the training is usually directed at changing the behavior of the individual receiving the training so that he can more adequately perform his occupational role. It is assumed that the resultant behavior will result in certain activities that will contribute to the attainment of goals and objectives of the organization in which he works. The personnel conducting the Iowa State University experimental dealer training program expected changes in the general managers' behavior, in the activities of the business firms, for which they work and outcomes for their business firms.

The experimental design of the project on which this study is based called for two groups of general managers. The treatment group of general managers participated in the training program while the control group did not. There were eight matched pairs of general managers (eight treatment, two alternate treatment and eight control) in the study. They were all general managers (two

were owner-manager) of established farm supply businesses for which fertilizer and agricultural chemicals were product lines. The businesses were all located in a nine county area in north central Iowa. The types of retail farm supply businesses represented were private ownership-including partnership and family corporations, Farm Service companies, line corporations, and cooperatives. Of the 18 general managers who composed the original grouping, data were available for eight treatment and five control managers in the areas of knowledge, attitudes and performance. Economic data were secured for nine treatment and six control.

The training program consisted of a five-day workshop followed by 16 meetings during the next two and one-half years. The subject matter presented consisted of basic business management, merchandising, and product information about fertilizer and agricultural chemicals. Iowa State University extension specialists conducted the majority of the training.

Knowledge, attitude, performance and activity data were collected from the general managers through personal interviews conducted before, during and after the training period. Economic data were collected from the business records of the retail firms.

In the section, Findings-Matched Pairs, eight general empirical hypotheses, four concerning knowledge and four concerning attitudes, were presented in relation to four content areas of the training program (see p. 31). These content areas were: fertilizer; selling (advertising, promotion and merchandising); dealer role with farmer customers; and management. The results from the testing of seventy-seven specific empirical hypotheses were presented. The empirical hypotheses were of two types. One type, of which there were sixty-one, compared the treatment and control dealers as to differences which were predicted would result from the training program (see pages 31-34). The second type, of which there were sixteen, predicted the effect of the training program on the treatment dealers' perception of changes that had taken place within them and their businesses as a result of training (see pages 34-35). In a descriptive framework, the results for fourteen economic variables were presented.

Of the sixty-one specific empirical hypotheses which compared treatment and control dealers, seven of the tests showed statistically significant results. From the results of the analysis used to test these specific empirical hypotheses, the conclusion was made that the specific hypotheses and consequently the general hypotheses were not statistically supported. However, in spite of the failure of the results to show statistical significance, they did show a favorable trend

in the direction of the treatment dealers. Of these sixty-one empirical hypotheses, forty of the tests had positive values (positive being in favor of the treatment dealers, as predicted), sixteen had negative values and five had a value of zero. Because of limitations involved in the statistical analysis of a small sample size and the amount of change required to show significant differences between samples of small sizes, the statistical results may be viewed within these limitations.

The sixteen specific empirical hypotheses, which predicted the effect of the training program on the treatment dealers' perception of changes that had taken place within themselves and their businesses, showed that the mean credit that they gave the training program for these changes was half way between "some" and "much".

Comparing 1961 to 1960, of the six pairs, four or more of the treatment general managers increased more than their respective matches on ten of the fourteen economic variables. Comparing 1962 to 1960, four or more of the treatment general managers increased more than their respective matches on eight of the fourteen economic variables. On four of the fourteen economic variables, it was an even division--three treatment general managers increased more than their respective matches and three treatment general managers increased less than their respective matches.

Based on matched pair analysis and within the limitations of sample size and length of the training period, it is the judgment of the authors that the training program was successful in changing selected attitudes and knowledge in predicted directions. It appears the treatment general managers were able to increase selected economic returns to the business.

In the section, Findings--Treatment Versus Control, the results from testing seventy-three empirical hypotheses concerning knowledge, attitudes, performance, general management and firm, and economic variables were presented. Eleven of the empirical hypotheses were given statistical support. These included: three in the area of knowledge, three in the area of attitudes, one in the area of performance and four in the area of general management and firm variables. The results of the statistical analysis gave little statistical support to the empirical hypotheses. From this it was concluded that the general hypotheses concerning the areas of knowledge, attitudes, performance, general management, firm and economic variables were not supported. Because the research project was exploratory in nature and the sample size small, some descriptive statistics and discussion was included in this section. The

discussion centered on a percentage comparison on some measures and a comparison of means on other measures to determine if a trend in favor of either group existed. Variables in favor of the treatment general managers included: five in the area of knowledge, two in the area of attitudes, thirteen in the area of performance, four in the area of general management and firm and fourteen in the area of economic returns (using the average for both 1961 and 1962--if 1961 versus 1960 is used, the number is 14--if 1962 versus 1960 is used, the number is 13). If these thirty-eight variables are added to the eleven statistically significant variables, a total of forty-nine of the seventy-three variables were in favor of the treatment general managers. For seventeen variables the trend was not in favor of either group and for seven variables the trend was in favor of the control general managers.

As previously pointed out, descriptive statistics and discussion was presented because of the exploratory nature of the project, the small size and limitations of the statistical analysis. The statistical analysis used did provide a systematic and unbiased method of analyzing the data. In examining the results of the statistical tests, the limitations should be kept in mind; however it is sometimes desirable to make inferences beyond the statistical tests. Ultimately, each individual may set his own criteria of what is of practical significance. The descriptive statistics and comparison of percentages and means for the treatment and control group was presented to provide additional insights about the influence of the training program in this exploratory research.

Based on participant observation, trends, descriptive statistics and the general managers' perceptions, the measured results from this program might be judged to approach some criteria which one might use to accept the training program as adequate. Within the limitations of sample size and length of training, it is the judgment of the authors that the training program was successful in bringing about changes in selected areas of knowledge, attitudes and performance. It appears the treatment dealers had more favorable changes in economic returns to their businesses. More research is needed before generalizations about this type of training can be made concerning dealers in different situations and environments.

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